THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXIX. No. 1762.] LONDON, FEBRUARY 16, 1897. [49TH YEAR. PRICE 6d.

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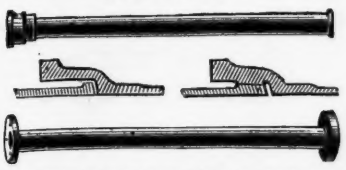

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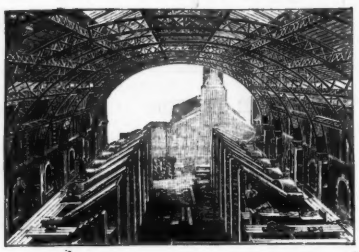

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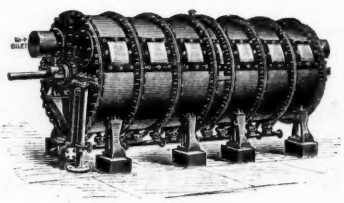

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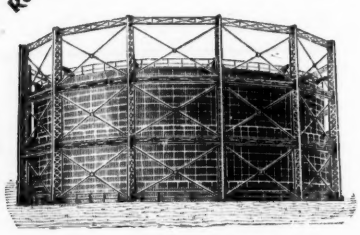

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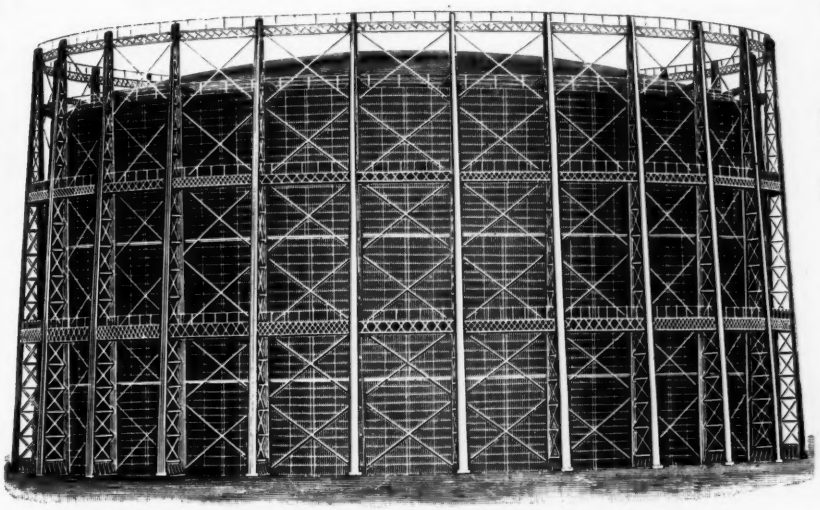

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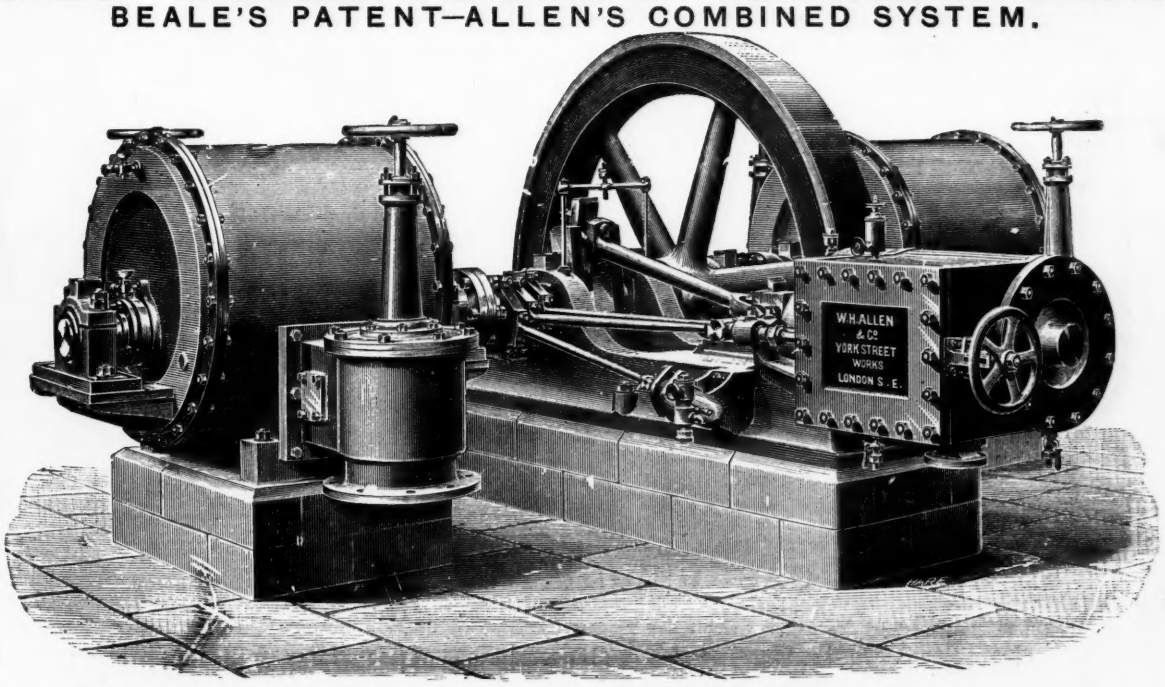

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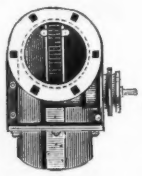

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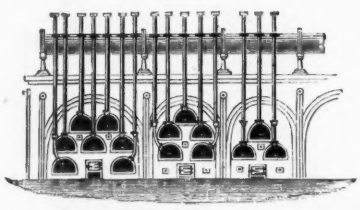

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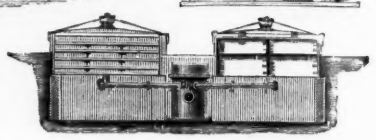

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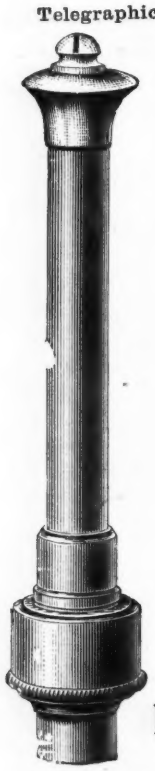

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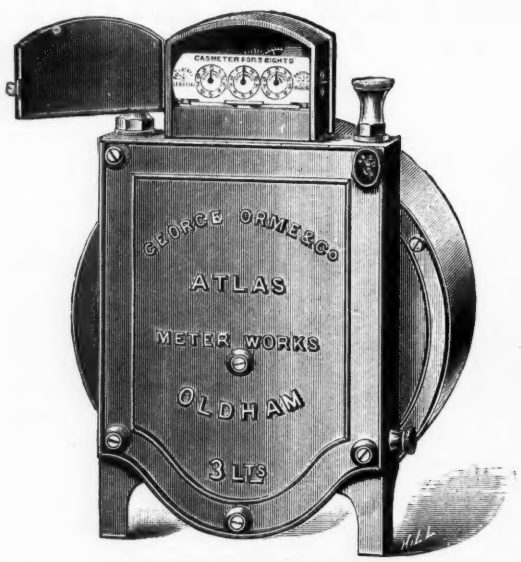

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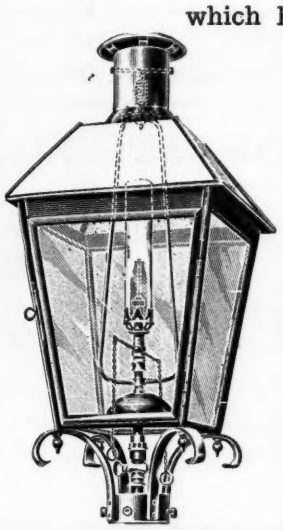

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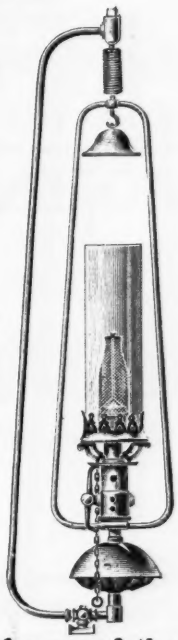

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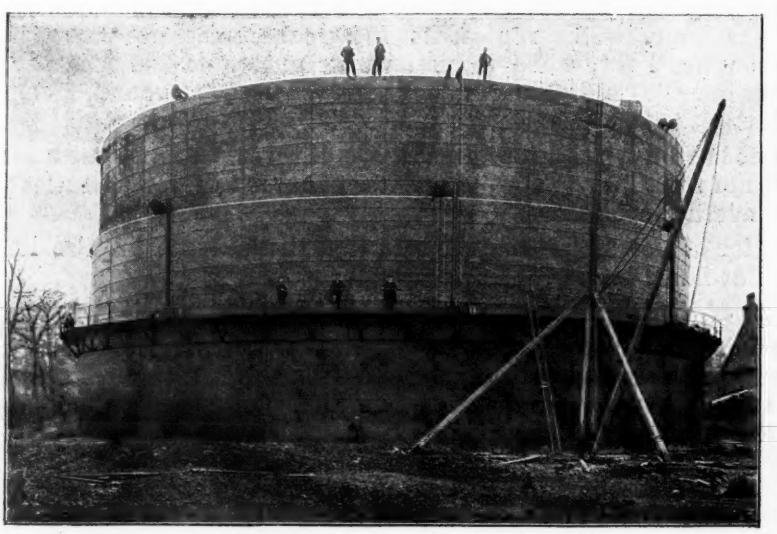

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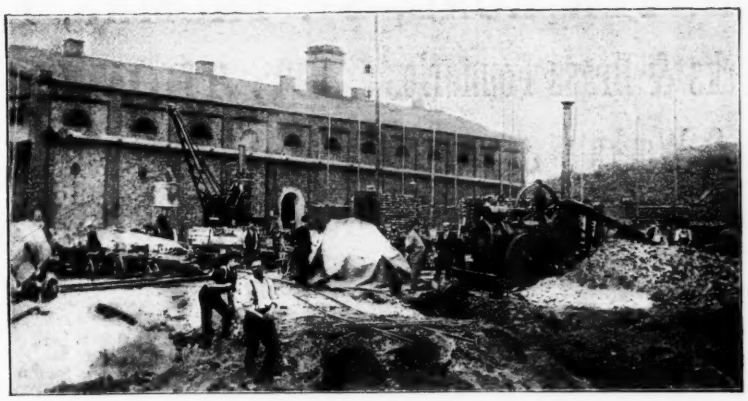

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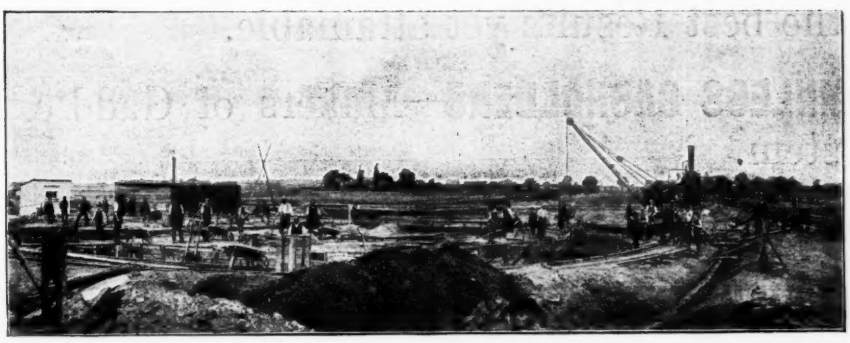

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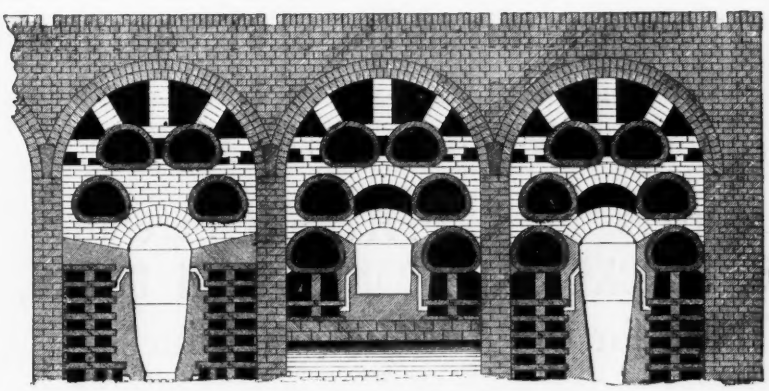

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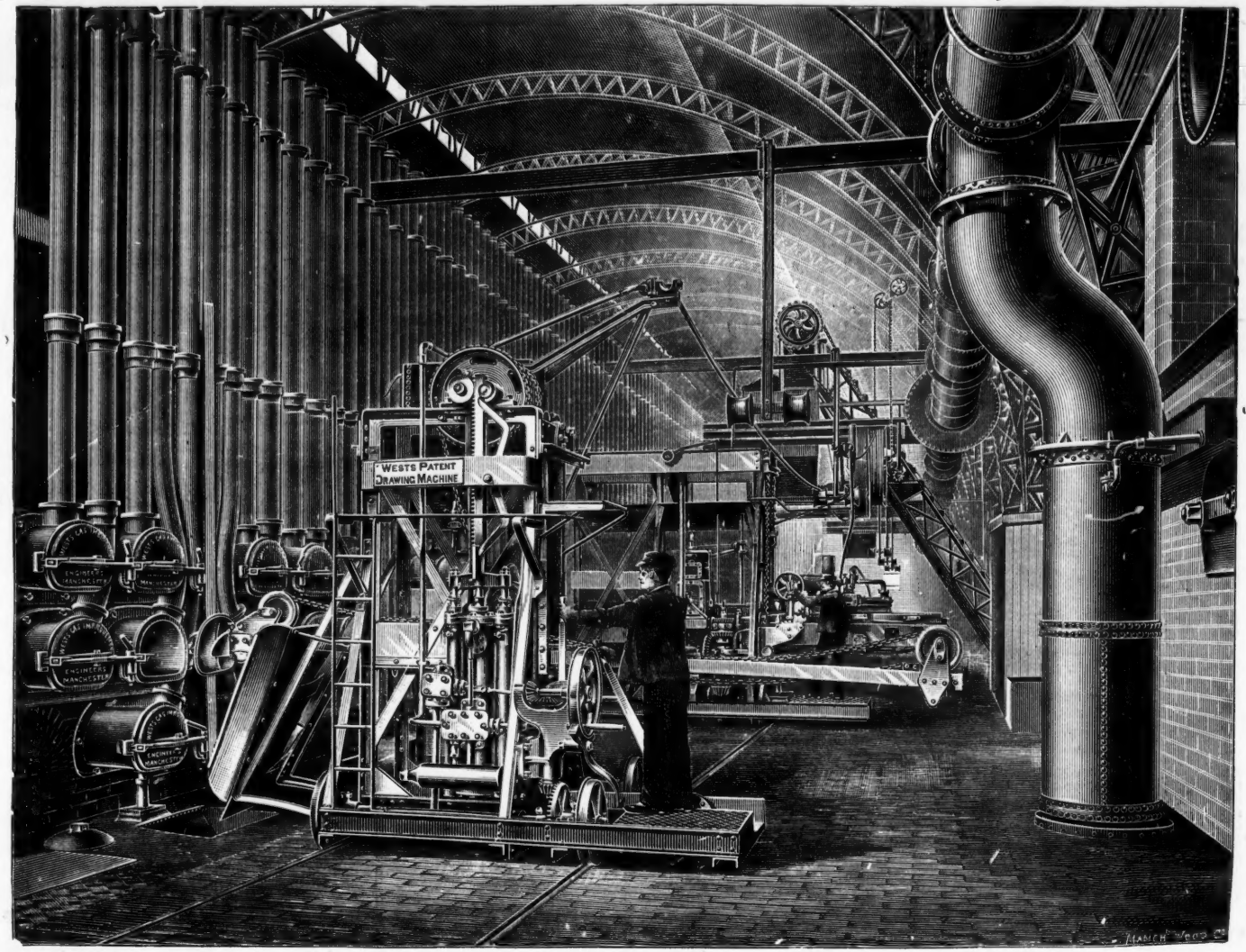

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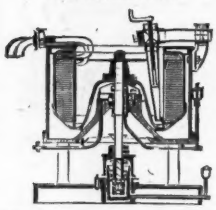

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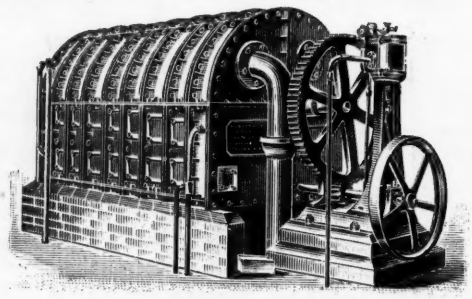

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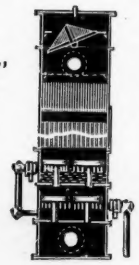

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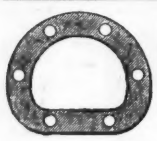

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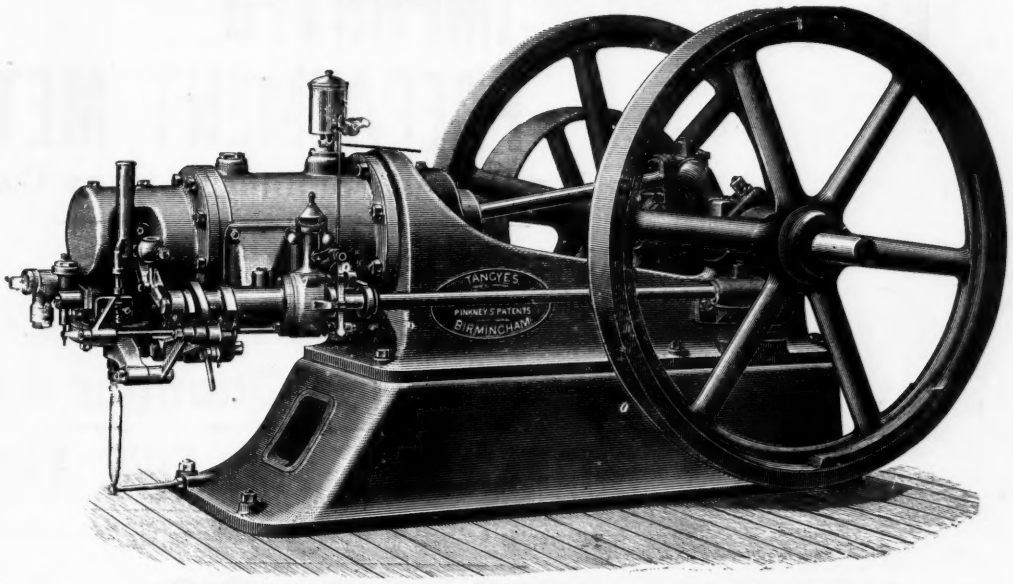

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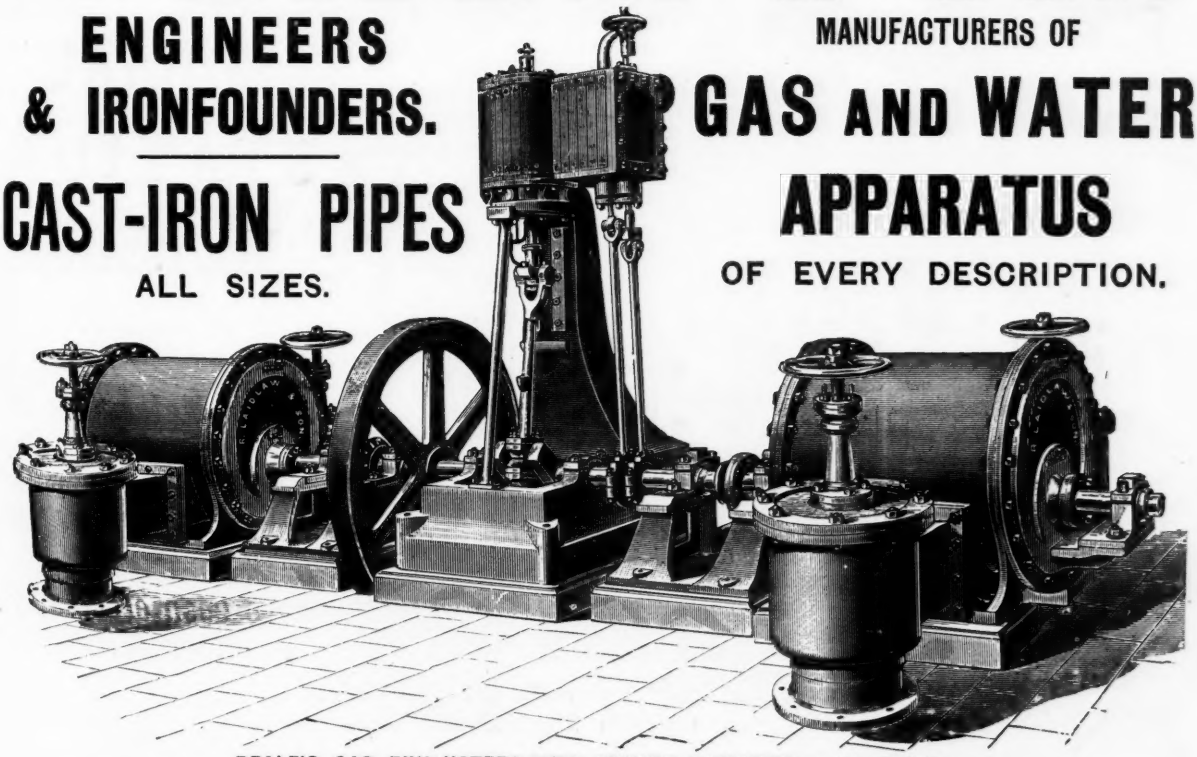

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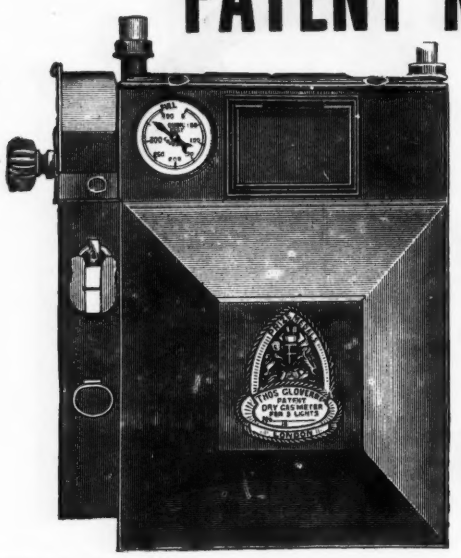

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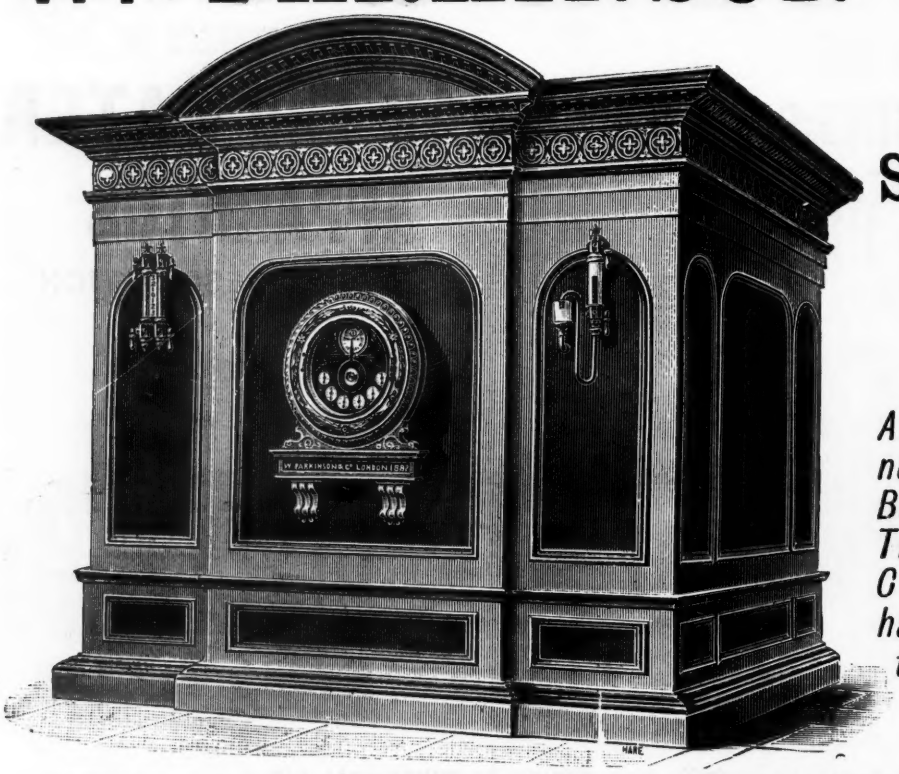

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EDITORIAL NOTES.

The Southern Association Meeting—A Board of Research.

THE annual meeting of the members of the Southern District Association of Gas Managers was held on Thursday last, under the presidency of Mr. J. W. Helps, of Croydon. The attendance was not large, considering that this was the first gathering of the kind to be held after the amalgamation of the South-Western with the Southern Association; but those who attended were amply rewarded by the exceptional interest of the proceedings. The presidential address of Mr. Helps will enhance a reputation already high, and will be read by gas engineers all the world over with keen appreciation of its matter and enjoyment of its style. In very many respects the address is a pattern composition of its kind; being informing, suggestive, and above all things bright and interesting with that peculiar quality of interest which never fails to attach to the revelation of a worthy and engaging personality. A presidential address which is not redolent with the author's individuality is always a failure, however cleverly composed. A president of a technical society, as we have always argued, has not only the right, he is expected to be egotistical—of course, within limits that none but a congenital bore would overpass. Mr. Helps could not be a bore if he tried; it is not in his blood or breeding. His address contained many observations and reflections which will not be found the less entertaining and instructive by reason of their leaving unsolved very many of the problems raised.

The address, which was listened to by all with deep attention, concluded with a re-statement of the author's plea for a better utilization of the force of united action in the interest of the gas industry which these Associations should be able to exert, but as a matter of fact do not. It is possible to agree with the spirit of Mr. Helps' suggestions in this regard, while taking exception to their character. The National and District Associations of Gas Engineers and Managers which now divide the land between them, fail lamentably to exercise the combined strength which is theirs upon the problems which confront gas engineering science and practice at every turn. Every Secretary of such organizations complains of the difficulty of getting the members to write papers; and when papers are forthcoming, they are of the most fortuitous character. It is hopeless to think that our Technical Associations will ever receive such magnificent support from Gas Companies as Mr. Helps talks about, until they can show a better record of systematic work than they have hitherto attempted to enter upon. Now and again a limited research, or a half-hearted piece of statistical compilation, has been done by one or another of these societies; but what does the whole amount to? The general body of members of Associations are far too apathetic to move in reforming this condition of corporate ineffectiveness. They are quite content to meet on occasion and talk "shop" with one another. And a very good thing, too, is this shop talk; the Associations fulfil no mean office in merely providing regularly recurring opportunities for indulging in it. Yet, strangely enough, experience shows that those Technical Societies that do not provide their members with a programme of business to be transacted at the meetings cannot long sustain themselves on the provision of shop talk. Like schoolboys, the members may prefer to "play" among themselves rather than take part in set games; but if there are no formal games, there will be no gathering for play of any sort. It is one of the contradictions of human nature.

We venture to commend to the earnest consideration of Mr. Helps and those who think with him that the collective wisdom of our Technical Parliaments should be put to some use, the following suggestion for a direct, simple, and inexpensive procedure to this end. Let the Committee of the Association nominate (say) three or five of their busiest members to constitute a standing Board of Research. This Board, either on its own initiative or being moved thereto by resolution of a meeting of the Association, should take cognizance of any debateable point of a paper or other matter that had come before the members in the ordinary way, and should undertake to investigate it. In doing this effectually, the Board would need assistance; and this might be arranged for with the co-operation

of the directors and professors of a secondary college or technical school, whose pupils would be only too glad of the opportunity of doing some practical work. Supposing, for example, a paper is read describing some device for overcoming a known difficulty of technic. After the paper had been received, and discussed on the author's own presentment of his case, the Board of Research (with his consent) would proceed to check his statements and test his deductions. The unpaid assistants would take all weights, make all measurements, and, in short, do whatever the Board might indicate as essential to the establishment or otherwise of the author's position. Then the subject might or might not be discussed over again on the report; and so information would be caused to spread. The idea is perhaps a crude one; but, such as it is, it appears at least to offer a prospect of realizing a part of Mr. Helps' aspirations, and opens the door for further discussion. Mr. Helps has the first say in the matter; it is for him to move, so far as the Southern Association is concerned.

Brentford and the Inclined Retort System.

THE working of the Brentford Gas Company for the past half year, as explained in the speech of the Chairman, Mr. Howard Charles Ward, at the general meeting held last Friday, merits particular attention from those who are interested in the fortunes of the gas industry generally, and also from every gas engineer. The undertaking occupies a large and straggling district bounding that of The Gaslight and Coke Company to the west. Much of this area is covered with dwellings of a poor class; and the better residential centres, of which it is not destitute, are few and far between. In the very best of these oases—the Ealing district—the Local Authority have been so ill-advised as to embark upon electric lighting; and though this speculation has so far proved unfortunate, it might have been expected to make a hole in the Gas Company's local connection. The facts, however, are quite otherwise. The Company had the big increase of 10 per cent. in their total gas consumption; and in Ealing itself, as the Chairman asserts, "in the whole of the houses in which the "electric light had been adopted in that particular dis-"trict, they had only a decrease of £60 in their sales of "gas." This is a statement as to which Mr. Ward remarked diffidently, "perhaps it would scarcely be believed." The strength of the Brentford undertaking, however, lies in the gas-consuming capacity of the large workmen's quarters, which is only now being rendered available by the prepayment meter. It is a curious reflection that the cottager class of the community are just discovering in gas those qualities with which the classes above them in the social scale have so long been familiar. The technical interest of the Brentford accounts lies in the vindication they afford of the inclined retort system of carbonizing. The Company have a station (their old one at Brentford) which has been converted wholly to this system; and the newer station at Southall is very nearly in the same case. We believe that Brentford is the only gas-works in the United Kingdom wherein the inclined retort is exclusively used. This result has been brought about by the firm faith and perseverance of the Company's Chief Engineer, Mr. Frank Morris, and his assistant-in-charge at Brentford, Mr. J. Husband. Now at length this devotion to the idea of gravity charging and discharging for gas-retorts is having its reward. The Chairman alluded in his speech to the realized saving due to the system; and it is but fair to the Engineers that the actual figures should be given the prominence that is their due. Carbonizing wages, which for the last half of 1895 stood the Company in £7429, were brought down last year to £7207, notwithstanding the increase in the weight of coal carbonized by 8388 tons. That is to say, the carbonizing wages work out for the last half year to a fraction over 1s. 11d. per ton, all told. When Mr. Husband read a paper on the inclined retorts at Brentford before the Institution of Gas Engineers, his critics threw at his head the published figures of the Company's working. He has "lain low" ever since, and waited for the justification that has now come. The Company's Engineers are to be congratulated upon their well-earned triumph in producing the absolute lowest carbonizing wages cost on record—speaking, that is to say, with reference to the undertakings listed in "Field." Here is the fact, and it should be ungrudgingly recognized. There has been no trumpeting of the matter from Brentford; but it has been left for us to disinter the truth from the accounts. The advantage on the side of the Brentford Gas Company in this regard, moreover, is not an insignificant fraction, but a substantial economy. If The Gaslight and Coke Company, who share their directorate—but not their executive—with the Brentford Company, could only follow suit, their huge revenue account would be improved by the trifle of £150,000 a year. Many other undertakings would benefit in an equal proportion. It would not, indeed, in such instances, be mere improvement, but a revolution.

The Cheapest Gas on Earth.

WIDNES is to be complimented upon the possession of the cheapest gas supply on earth. This pre-eminence has long been within a measurable distance of attainment by the town; but the recent action of the Corporation in reducing the price by 2d. per 1000 cubic feet has secured it beyond the possibility of cavil. Small consumers will now be able to get the town's gas for 1s. 8d. net per 1000 cubic feet; and for all consumption over 3 million cubic feet per annum the price will be 2d. per 1000 cubic feet less. Consumers by prepayment meters will get 33 cubic feet of gas for a penny. This concession has been made by the Corporation, in the first place, because they have no power to misapply the gas profits in subsidizing their spending departments; and, secondly, in order to forestall the tempters who had approached the large consumers with invitations to make their own gas or to adopt the electric light. When it is remembered that Widnes gas is of 17½-candle power, it becomes evident that it could not pay any factory-owner to dally with any other means of lighting. The local manufacturers and householders who will have the benefit of the reduction may well be grateful to the Local Government Board for placing a check upon the party in the Council which lately sought access to the Gas Department till—not with a view of appropriating any of the money, but only to show their trustworthiness. It was a good thing that this variety of the confidence trick was stopped before it could be put in operation. Gas in every town, and especially in a place like Widnes, is no luxury to be taxed for the support of the necessitous. It is a raw material of manufacture and public utility which every canon of Free Trade would place at the disposal of the community at the lowest possible price. This is the best argument against the specious contention that a municipalized gas supply ought to return a profit to the ratepayers to be applied in reduction of the rates. Cheap gas is one of the best agencies that can be provided in a town to enable ratepayers to create those profits and found that assessable prosperity out of which rates are properly payable. It is very easy to perceive that, in the countries where indirect taxation is rampant, industry correspondingly languishes; but it is difficult to identify this pernicious connection with the gas consumers' tax as imposed by many English Corporations that ought to know better. There is now talk in Widnes of a chemical works having an intention of putting down gas power plant likely to consume 2 million cubic feet per annum. Would this be done if the consumer knew that for every 1000 cubic feet of gas so burnt the sum of 2d. or thereabouts was being contributed to relieve the rates of other people?

A Question of Water Gas at Stockport.

TRADES Councils may be excellent things in some respects; but that the machinery they provide for the discussion of all sorts of subjects from the Trade Union side lends itself to the perpetration of abuses, appears pretty clearly from recent doings at the Stockport Trades Council. A paper on "Water Gas" was read last Tuesday before the delegates constituting this organization, by somebody who tried to make out that the local manufacture of carburetted water gas was an essay in manslaughter. In the actual state of public opinion in that part of the world on the subject of the manufacture and distribution of carburetted water gas, the dissemination of inflammatory statements respecting the product is to be deprecated. No such consideration, however, prevented the Stockport lecturer from trying to make his hearers' blood run cold at the contemplation of the horrible consequences that would ensue if this vital fluid were to come into contact with a sufficiency of the carbonic oxide with which the Stockport Corporation were assumed to be in the habit of supplying to their gas consumers. The man in the popular ditty who had the "upazeutic"—we cannot answer for the spelling of the name of this frightful disease—would apparently be in the enjoyment of boisterous health in comparison with what might at any moment come upon these victims of a too enter-

prising Municipality. The lecturer seemed, however, to have "piled up the agony" too high; for though he did his best to rivet his hearers' attention upon the toxic properties of water gas, the moment he had finished, the delegates from the local "gassers" began to expose the trick. What they wanted to say was that the Union did not like the carburetted water-gas plant; which is quite easy to understand. They also wanted the associated Trade Unions "to get a solicitor to give formal notice to "the Town Clerk that, if any injury was caused to "a member affiliated with the Trades Council through "the introduction of water gas, the Council intended "to take action against the Corporation." Some of the delegates from other Unions thought there might possibly be another side to the question besides that which had been shown to the meeting with such lurid detail; and, after some discussion, it was resolved to invite the Chairman of the Gas Committee to attend and explain why carburetted water gas had been introduced into the Stockport gas undertaking. Trade Union delegates can be rational enough when their own particular interests are threatened; and it is this show of reasonableness that has so often deceived outsiders as to the character of the movement. Let the shoe pinch the delegate himself, however, and he will quickly exhibit the intolerance of mechanical improvements which instigated this Stockport protest of the "gassers." The motive power of much of the present outcry against carburetted water gas in Lancashire is of political origin.

The British Patent Law and the Foreign Inventor.

THE remarks on the patent laws by Sir B. Samuelson, discussed in these columns last week, gave rise to a series of questions addressed by Captain Phillpotts on Thursday, in the House of Commons, to the President of the Board of Trade. The questioner inquired, in the usual form, whether the President "was aware" of the conditions stated by Sir B. Samuelson to have contributed to the planting and development of the coal-tar colour industry in Germany; and if he would "take steps, in the interests "of home industries and home labour, to bring the patent "laws of the United Kingdom into conformity with those "of every other European country." To these questions the driest of dry official replies was returned. The questioner was duly and very properly referred to "section 22 "of the Patents Act, 1883," which provides that, under certain conditions, patentees may be compelled to grant licences for the working of patents in the United Kingdom. The President of the Board of Trade is reported to have remarked in addition that, "in the absence of any decision "to the contrary, he was not satisfied that the law is not "effectual as it now stands to meet the cases suggested in "the question;" and that he did not purpose doing anything in the matter. Thus does officialdom help industry and enterprise in this favoured land. It is, of course, the truth that the specific mischief instanced by Sir B. Samuelson arose antecedently to the present Patents, &c., Act, which only dates from 1883. The clause to compel licences to be granted so that foreigners' patents might be worked in this country was introduced into British patent law for the first time by this Act—too late to prevent the evil mentioned. It may be noticed that in Mr. Roger Wallace's book on the English patent law this innovation is greeted with the following guarded comment: "It will prove of great public "benefit if patentees are enabled by its instrumentality "to combine the inventions of others with their own, and "thus produce more efficient machines and products of "better quality"—a singularly weak observation upon a change of such vast theoretic magnitude. Again: "Foreign "inventors who take out patents in this country without "any intention of working here, but merely to prevent any "competition in this country, will find it difficult to do so "in future if this section is properly carried out." The question is: Has the section been carried out to any extent, and with what results to British industry?

A Research Committee for the Societe Technique.—A Committee of the Société Technique du Gaz en France has been constituted for the purpose of investigating technical questions connected with the gas industry and the industries allied thereto. It is composed of the officers and six outside members; but it will, of course, be open to any of the General Committee who may be able to attend. Three Past-Presidents of the Society—MM. Melon, Mallet, and De Lachomette—have been elected, with MM. Cornuault, Leclerc, and Thibaudet.

WATER AND SANITARY AFFAIRS.

THE Eastern Question is simplicity itself compared with the complication which now surrounds the subject of the Metropolitan Water Supply. Divergent views and conflicting schemes, with a general uncertainty as to what is coming to pass, serve to demonstrate the one great mistake which governs the whole affair—namely, the want of that wisdom which knows how to leave well alone. It is easy to imagine an ideal state of things; but it is not always prudent to go in pursuit of it. There is reason to fear that the water-grabbing policy which is now prevalent in and about the Metropolis will lead to some disastrous results. Ratepayers and consumers have alike reason to pray that they may be saved from their professed friends. If there is to be a change in the administration of the London Water Supply, the only prospect is that of dearer water and stricter regulations; the management being placed in hands possessing despotic power. How to effect any real improvement in the present arrangements with regard to the supply is the last thing that is brought to light. The Government are evidently at a loss, and would be glad to get the question off their hands. Mr. Chaplin, at his conference with the London Unionist members at the beginning of last week, electrified them by the announcement that the Government were prepared to support the County Council Purchase Bills on the second reading. This was understood to mean that the Government would allow the Bills to go before a Select Committee, with a view to settle a scheme of purchase, but not necessarily agreeing to let the Council have possession. So the "Daily "Chronicle" understood it, and dreaded the prospect of a Trust. On Thursday morning, "The Times" and other papers announced that Mr. Chaplin would meet the London Unionist members at their adjourned gathering in the afternoon. The members duly met; but Mr. Chaplin was absent. As both meetings were private, it is difficult to know precisely what took place; but it is stated that at the second meeting it was resolved to oppose the Purchase Bills, and it was decided that a letter should be sent to Lord Salisbury, urging the Government to adopt a similar course. It is understood that a request was also made for the Government to introduce their own Bill.

The London Unionist members are alleged to be in a difficulty with their constituents, many having given them a promise that they would favour a scheme of purchase. These members of Parliament are said to be embarrassed by the uncertain attitude of the Government; and we find appeals made in the Press that the Ministry shall declare some decided policy in respect to the water supply. There is even an apprehension that the whole question will be shelved for the present session. Certainly the Purchase Bills offer a chance in that direction. If these Bills go forward, they may serve to cover a strategic movement to the rear on the part of the Government. But this will have to be adroitly managed, seeing that a Bill was promised in the Queen's Speech. The Government Bill and the County Council Bills may all go to one Committee, and be allowed to simmer together until the session is too far advanced for anything to be done. In the meantime, the County Council have shown their hand through the medium of their Parliamentary Committee. Every effort has been made to purchase the allegiance of the outside authorities. These are to have their local water supply all to themselves, providing they will support the second reading of the Council's Bills. There seems to be considerable difference of opinion as to who is to be taken in over this business. On the one hand, the arrangement is made to appear so favourable to London that we must assume the outer areas will have to suffer. According to other accounts, it is London that will be victimized. Our own conclusion is that neither party will be any the better for it. The so-called agreements are provisional and crude, as well as exceedingly complicated; substituting a mass of machinery for that which is now simple and effective. If ever these agreements come into force, the future of the London Water Supply will be fraught with confusion. The whole scheme is utterly artificial and absurd. If the Government connive at such a dislocation of the supply as the County Council propose, there will be an abandonment of a principle wisely advocated by Lord James of Hereford last year, and the door will be opened to endless troubles and disputes. The Water Companies will be extinguished,

but eight new bodies will be substituted. Sir John Lubbock says this; but we fear the case will prove even worse. If the Council's plan is adopted, the day will come, owing to the extension of the Metropolis, when the supply will have to be consolidated; and the cost of doing this will be a very serious matter. One element in the agreements is very properly objected to. It is that which gives the authority of an outer area the power of deciding, at any time within two years after the arbitration has determined the price which London will have to pay, whether it will join in the purchase, or will take a supply from the Council. Of course, the option would be exercised to the disadvantage of the central area.

But perhaps a yet more serious objection applies to the principle laid down by the Parliamentary Committee, that the supply of the outer areas ought to be administered by the several Local Authorities. This arrangement is described as a right which should be conceded to such authorities, while London claims the same right in respect to its own area. This localizing of the water supply is a sheer pretence. The question is not merely one of supply, but of source. If West Ham or Middlesex has an independent source of supply, the Local Authority might be granted the control of it. But these places will trench upon the sources which supply the central area; and as such they should be included with it. The London County Council may prefer to cast off the outer area, as being the least profitable, and may coax the Local Authorities into a notion that the change will be to their advantage. But if ever the Purchase Bills are passed, it will be found that neither London nor the authorities of the outer area have any cause to be grateful to the County Council. The object of the latter is an increase of revenue; and the whole project is one of expediency, in which—to use the language of Mr. Beachcroft—the County Councils of London and the outer area are playing "a game of "scramble over the carcase of the Companies," though happily the Companies have life left in them yet. With respect to the intentions of the Government, the "Pall "Mall Gazette" yesterday stated that the promised Bill will be brought in; but the question will probably have to be referred to a Committee for further inquiry, and the Purchase Bills will be allowed to be read a second time in order that they may be referred to this Committee. The Government are said to be opposed to the Bills, and are believed to favour a scheme of control, to be carried out either by the County Council alone or in conjunction with the representatives of other bodies. As the Purchase Bills are down for second reading on Thursday, we may hope by that time to be further enlightened with regard to the situation.

PERSONAL.

Mr. Oscar J. Kirby, Assoc.M.Inst.C.E., the Engineer and Manager of the Batley Corporation Water-Works, has been appointed Borough Surveyor, subject to his resigning his old position. He will therefore no longer manage the distribution of the water; but he will be the Engineer of the impounding reservoirs of the Corporation.

The duties connected with the office of City Surveyor of Wakefield (which is at present filled by Mr. R. Porter) have become so heavy and important as to necessitate some relief being given. It has therefore been decided to remove from the City Surveyor's department the work of the water undertaking, and to appoint as Water Engineer Mr. C. C. Smith, who has for some time past held the position of Clerk of Works for the Corporation at the Green Withens reservoir.

OBITUARY.

The death took place on the 3rd inst., at Tottenham, of Mr. R. W. Brett, who until about two years ago was Manager and Secretary of the Hertford Gas Company—a position which he relinquished under circumstances which will doubtless be in the recollection of our readers. Mr. Brett's father was formerly Manager of the gas-works at Ware, and subsequently of those at Hertford. Mr. R. W. Brett was born at the first-named place; and, after being for a time in the office of some local builders, he was sent to the Manchester Gas-Works, where he received his technical training. In 1869, he succeeded his father as Manager at Hertford; and about eight or nine years ago he was entrusted also with the secretarial duties. On leaving the town, where he was succeeded by Mr. R. Watson, he came to London, and commenced business in Water Lane, Great Tower Street. He had been in fairly good health up to within three days of his death, which resulted from pneumonia. He was fifty years of age.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 370.)

The Stock Markets have presented a gloomy appearance during the past week, as the result of the disturbing news from Crete; and most of the active stocks have fallen. Attention was chiefly directed to the settlement, although there was not much of a speculative account to arrange, as operators are holding aloof while Eastern politics are so unsettled. Consols fell about ½, but partly recovered; while Home Rails are down ½ to 2 per cent. Americans have kept fairly steady, though slightly easier. In the Money Market, short loans are still easily obtainable at the rate of 1½ per cent.; but discount houses' rates for three months bills are creeping up again, and are within a fraction of 2 per cent. Among the gilt-edged securities which have been in request during the week are the Gaslight issues. The "A" stock opened with a rise of 1; and by Wednesday it was quoted 318-23. The last quotation on Saturday was 315-20 *ex div.*, so that the stock actually stands 1 per cent. higher than before the dividend was taken off. Some of the other issues are likewise better, if allowance is made for the dividends. A little business has been done in South Metropolitan and Commercials. The Suburban and Provincial group has been very stagnant; the chief feature being the rise of 11 per cent. in Brighton "A" to 198-203. Bristol rose 4 to 130-35 on the announcement of the dividend at the rate of 5 per cent. On Friday, Alliance and Dublin had a gain of 1, to 24-26. In the Continental division, although several transactions in Imperial Continental were recorded up to 225, the price of the stock remains unaltered on the week. An inquiry prevailed for European on Saturday; and the quotation was advanced ½ to 25½-26½. On the other hand, Belgranos were dull, at a decline of ¼, to 9¾ to 10¼. A little business had been done in Bombay, San Paulo, and Hong Kong; but values are unaltered. Water stocks were extremely quiet throughout the week; but quotations were well maintained. The only alteration recorded was a rise of 1, to 150-55, in Southwark and Vauxhall 7½ per cent. maximum.

The daily operations were: Gas stocks were quiet on Monday; the most dealings being in Gaslight "A" between 317½ and 319—the stock finally closing 1 higher. Gaslight "C," "D," and "E" rose 2½; and Bristol 3. Imperial Continental was dealt in up to 225; and British Gas marked 57, and San Paulo 14. Water stocks were neglected and unaltered. Gaslight issues were again active on Tuesday; and the "A" stock rose 2—business being recorded at 321. Business was done in Imperial Continental at 224½, and in Hong Kong at 12⅜. Water stocks were again very quiet; but a few dealings were recorded in Lambeth, New River debentures, and Southwark and Vauxhall. Wednesday being the first day of the settlement, there was less business doing; but a further rise of 1 was recorded in Gaslight "A"—business for the new account being done at 322. Brighton and Hove ordinary rose 11; but Buenos Ayres new fell ¼. Continental Union marked 263, and Monte Video 15. Water stocks were again featureless. The market on Thursday was inactive; the only alteration recorded was a fall of ½ in Belgrano. Transactions took place in Gaslight "A" at 323; Commercial old, at 340; and Imperial Continental, at 224½. Water stocks remained unaltered. Friday was extremely quiet; the only change noted being a rise of 1 in Alliance and Dublin 10 per cent. Gaslight "A" again marked 323; Commercial old, 340; and Imperial Continental, 224¼. On Saturday, European Gas rose ½; otherwise there was no change. Gaslight "A" marked 317½ *ex div.*

ELECTRIC LIGHTING MEMORANDA.

Development of the Brighton System—A Plausible Recommendation—A Pertinent Question.

An important report by Mr. Arthur Wright, the Engineer of the Brighton Corporation electricity supply undertaking, upon the financial prospects of the concern, has created no small stir in the extensive region which follows the Brighton practice in charging for current. Mr. Wright is the pioneer of one of the most remarkable systems of differential charging for electricity supplies ever devised, the principle of which is too familiar to require detailed description here. Briefly, it is an attempt to adjust the rate of payment by consumers to the load factor of the day; so that those who only help to elevate the "peak" of the daily diagram representing the output of the station, have to pay more in proportion than those who use their lamps over a longer period of the twenty-four hours than that in which the "peak" occurs. Opinions differ as to the universal applicability of the system, which can only be justified by reference to the essentially hand-to-mouth nature of the supply to which it is adapted. If electricty could be stored, like gas or water, against a sudden demand, there would be no justification for charging a higher price for it at one time than at another. But it cannot be stored. It must be produced on the instant as wanted, in whatever quantity; and hence there is no injustice in adapting the price of the product to the cost of producing it,

whether this involves the recognition of a time element in the schedule or any other consideration that can be shown to affect the expenses of manufacture. Mr. Wright proposes to make a new departure in this respect, starting from the realized financial success of the Brighton undertaking for the past year. He finds from last year's results, that after the plant has been "got ready" for its daily work—that is, after all arrangements have been made to surmount the peak of the day's load diagram—the extra cost of continuing the supply is no more than five-eighths of a penny per unit. In other words, supposing every customer to have been charged last year a "stand-by" assessment of ¼d. per lamp per day, which would have covered the expense of getting the plant ready to furnish him with current in case of his needing it, he might have been supplied with all the electricity he actually consumed at the rate of ¾d. per unit; and the undertaking would have made a profit of £1000. This statement brings into high relief the peculiar conditions of central station electricity supply—exhibiting the business as a communal service rather than as a dealing in a commodity.

Starting from this standpoint, Mr. Wright proceeds to consider how the Brighton electricity supply service can be best charged for in the current year, when it is assumed that about 2,000,000 units will have to be distributed in the district. He says: "If all the units, after the first hour's daily use at 7d., were charged at 1d. each, the entire expenditure would be covered by the revenue. As, however, something undoubtedly ought to be put aside every year to the contingency fund, I strongly recommend you [the Committee] for the present year to fix the charge for the low-price units, not at 1d., but at 1½d. *This will ensure our making an adequate net profit, while at the same time it will give a very considerable impetus to the use of electricity in private houses and for motors.*" The italics are in the report. It is further explained that this alteration of the tariff will greatly benefit the general body of ratepayers, who will, through their district fund, get the electricity consumed by the street lamps at "something under 2d. per unit, instead of at 3¾d. It will also have the effect of reducing the price paid by private houses and shops from about 5d. to 4d. per unit." The last figures are of capital importance. Further, the report explains that "*a tariff of 1½d. after the first hour* will make electricity, if it be used regularly, as economical for power purposes or for cooking as the average gas engine or stove. . . . There are probably some 60 or 70 gas-engines still running in Brighton." The italics in the passage are ours this time. The official commentary upon the report runs as follows: "The Committee recommend that the initial charge of 7d. per unit for the average of one hour per lamp per day shall be continued, and that the charge for electricity over such average shall be reduced from 3d. to 1½d. per unit." The recommendation was adopted.

Of course, as soon as the nature of Mr. Wright's proposal became public, all the newspapers that keep "leaderette" writers on the look-out for bits of scientific and technical news to be prepared for consumption by the general reader, promptly misinformed the public that henceforward Brighton is to be blessed with electricity supplied at 1½d. a unit all round, which would be considerably lower than the price of gas. Some of the London newspapers indignantly wanted to know why the same thing could not be done for the Metropolis. "Why should London wait an indefinite period for the boon that Brighton is to enjoy forthwith?" and so forth. It is unnecessary to indicate further the wild work made by the London newspaper paragraphists with this bit of Brighton news. If these clever gentlemen had only given themselves the trouble to inquire in a proper quarter exactly what Mr. Wright's proposal means and might be taken as amounting to, in Brighton and elsewhere, their reflections on the subject would have taken another turn, quite as interesting and more profitable to the public at large. For the leading electrical journals are not under any misapprehension with regard to this matter. The "Electrical Review" in a curt editorial note headed "3¾d. per unit"—not 1½d.—admits the importance of Mr. Wright's report, and congratulates Brighton on getting its electricity at so cheap a rate. It, however, declined to discuss in all its bearings the Brighton system of charging, winding up with a praiseworthy aspiration after a "general lowering" of the price charged for electricity. The "Electrician" is more outspoken in regard to the merits of the system, which is somewhat contemptuously described as chiefly benefiting "the small shopkeeper who lives over his shop." It should be obvious that there are two sides to the system, even for Brighton, and that it must wholly fail to touch the problem of cheapening electricity supplies in the largest, and indeed in the majority, of business communities. It may suit the "small shopkeeper" of Brighton, or the lodging-house keeper, both of whom, for all we know, may be strongly represented in the Corporation. There is no getting over the fact, however, that under this system such consumers are benefited, not by the Corporation at their own expense, but at that of the large business houses and establishments of all kinds where the daily use of electric lighting is necessarily of short duration. That "first hour" has always to be paid for; and it just catches the largest consumers, who in the case of gas would expect, and often receive, the greatest measure of whatever consideration and relief the prosperity of the undertaking might have to offer. Is it so certain that the resolution of the Brighton Electricity Supply Committee to "continue" the maximum charge of 7d. per unit, in order that the minimum charge might be reduced to 1½d. per unit, is to be preferred to a straight levelling down of the price to (say) 5d. per unit all round? We, at any rate, incline to answer the question in the negative; and, as Birdofredum Sawin sang: "I shouldn't greatly wonder if there's thousands o' my mind," even in Brighton itself. It will be a strange thing if the new jugglery with the prices and hours has any notable effect upon the Brighton gas-engines.

A KEY TO STREET LIGHTING EFFECTS.

THE observations that have been recently published concerning the substitution of incandescent gas-burners for electric lamps in the principal street centres of Paris enhance the interest of an article communicated by M. Maréchal to the "Génie Civil" on this subject. M. Maréchal is an engineer attached to the municipal service, and his handsome book on the public lighting of Paris has been favourably reviewed in these columns. No better or more independent expert authority could therefore be cited as likely to prove a really trustworthy guide to the determination of what constitutes the most approved Parisian practice in street lighting at any given epoch. An abstract of M. Maréchal's latest statements in this regard appears in another column. Our French contemporary the "Journal de l'Eclairage au Gaz" makes some interesting comments upon the subject of M. Maréchal's paper, which may be summarized as giving a French gas engineering view of the requirements and possibilities of street lighting.

This branch of gas lighting, it should be borne in mind, bulks very much more largely in the revenue accounts of most French gas companies than it does in the case of British gas undertakings. Indeed, many Continental gas concessions have been taken up mainly on the strength of the public lighting contracts—a circumstance which has been repeated in England in the early history of several of the electric lighting concerns, both private and municipal. Universal experience, however, shows that, whether the lighting is gas or electric, public lighting contracts are a resource that needs to be supplemented as early as possible by a sufficient private business, if the undertaking is to become commercially successful. It is practically impossible to make a lighting undertaking pay on the basis of the municipal contracts alone, not only because these have invariably to be taken at a reduction on what can be shown to be the proper charge for the service, but also because, when the lighting undertaking is obviously dependent upon the local authority, the latter rarely omits to take every possible advantage of the fact. There is one benefit, however, from having a preponderating public lighting connection, as we have pointed out on previous occasions in these columns. Where the local authority and the gas company do a large business together, so that the public lighting is an important consideration to both, improvements of the service are eagerly welcomed, and receive speedy attention and recognition. In many concessionary towns, the gas company contract to supply, not so much gas, but so much light for a stated price; and the influence of this condition on the introduction of gas economizing burners need not be explained at length. On the other hand, when local authorities are under the necessity of paying a street lighting bill three or four times as heavy as is customary in English towns, the desire for economy in this respect is naturally much sharpened. And, to do them credit, Continental municipalities who wish to save on their lighting bill do not usually fall into the error of parsimonious British highway authorities, and deprive their towns of light. The organized dimness that has hitherto passed for public lighting in Edinburgh, for example, would not be borne in the smallest French commune having gas at all.

For these reasons, therefore, every improved system of street lighting that has been brought out of late years has been more warmly received abroad than in the United Kingdom. Here, economy was the first consideration; and—whatever was the case in regard to the electric light—it has ever been regarded as a grave objection to improved street lighting by means of gas that it meant greater expense. There, while increased gas bills were not really better liked, the elevation of the standard of public lighting was regarded as something desirable in itself, and well worth a little sacrifice of money to obtain.

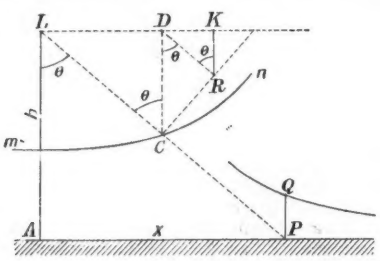
Our French contemporary already named observes that until recent years nobody knew how to improve street lighting by gas in any other way than by multiplying the number of lamp-posts, each carrying in a lantern "the classic 140-litre [about 5 cubic feet] batswing burner, covered generally with an opaque reflecting cap concentrating at the foot of the lamp-post all the superior radiation of the flame, and thus throwing upon the soil little zones of brightness which made the intervening dark spaces yet more obscure." These small light-sources, it is remarked, were incapable of lighting from the edges large open spaces or the centres of streets of any width; and the attempt to effect this object by placing additional lamp-columns in the spaces or along the middle of the streets was more objectionable, by reason of the obstruction to traffic, than effectual in securing the purpose intended.

Next came the creation of high-power lights, both electric and gas, which were received in Paris with enthusiasm, and for a time held their own in the "City of Light." Before long, however, it became a question of getting the same object served with less expenditure of gas; and recuperative and incandescent

burners took a conspicuous place in the streets. Meanwhile, those who had the management of the public lighting became convinced that the height of the lamp-posts and their distribution should be modified to suit the new standard of lighting. The Paris Municipality went into the subject scientifically, under the guidance of M. Maréchal, who adopted the plan of plotting curves of lighting intensities upon the street plans—a device, be it observed, which was not original with him. He has, at any rate, carried out the idea with great thoroughness.

Our contemporary, discussing the requirements of good street lighting, lays down the principle that "the *desideratum* to be attained is less the realization of a very brilliant lighting than that of a lighting sensibly uniform over the thoroughfare. These very well lit zones, scattered over surfaces half darkened, are more inconvenient than useful, because they render insufficient for those parts which are not in full light, a degree of lighting which, taken by itself, would give satisfaction. From the moment of its receiving a bright light, the eye accommodates itself to this state, and only gradually recovers the faculty of distinguishing objects in places lighted more softly." All this, of course, and more, has been expounded in these columns. Our contemporary goes on to cite the work performed by M. Blondel—first theoretically, and afterwards as part inventor of the "Holophane" globes—in solving the problem of the equal diffusion of light without local glare, and warmly commends the investigation of M. Maréchal.

M. Maréchal admits that while indispensable as lights—in the lighthouse sense of the term—the classic 5 cubic feet street-lamp burners are, between the posts, practically incapable of exercising any recognizable lighting effect. To perform such a duty—that is to say, to show a distinct illuminating effect as well as to show a light in themselves—street-lamps at the usual spacing ought to be at least three times as powerful as the 5 cubic feet batswing flame. Of course, this requirement can be satisfied by having three flames; but then there is the expense. Hence the problem of efficient street lighting, as proposed by M. Maréchal, consists in "lighting more without spending more." This is the grand opportunity of the Welsbach mantle, which certainly gives threefold the light of the ordinary street-lamp burner, and is only a little more expensive. In point of fact, in Paris it is customary to replace a batswing burner regulated to 140 litres per hour by an incandescent burner consuming 115 litres per hour. M. Maréchal's first care is to test the performance of such a substituted burner and construct its photometric curve, not as a new burner in an ordinary glass chimney, but as a street-light after from 30 to 35 days of service—say, about half the life of the mantle—installed in its proper lantern. The result is to show that the light-intensity of such a lamp in the horizontal plane—*i.e.*, at an angle of 90° with the lamp-post—is 40 candles. This increases to 48·8 candles at the slightly lower angle of 75°, which is the maximum; decreasing to 40·5 candles at 60°, to 28 candles at 45°, and to 17 candles at 30°. This is a very good distribution for the purpose of street lighting; and it supplies one reason for the success of the application of the Welsbach light to this purpose. It also goes to show how desirable, for the ordinary indoor uses of this light, is some kind of reflecting or refracting globe in order to increase the downward lighting effect. Having ascertained the character of the photometric curve of the incandescent lamp, as already noted, the next step is to determine, on the plan of a street provided with light-centres of this character, the so-called "curves of equal lighting." This is not difficult, and is effected by the aid of the diagram given below. By "curves of equal lighting," nothing more is meant than the traces uniting on the plan the points which receive the same lighting. They therefore resemble contour lines.



Assuming the lighting to be expressed in terms of a decimal candle (*bougie décimale* = 0·1 carcel) at one metre—that is to say, taking as the unit of lighting the effect produced by one decimal candle upon an element of surface placed parallel to the axis of the flame, and at one metre distance—the curves of equal lighting are graduated in decimal candles at one metre, or in decimal fractions thereof. The figure shows the graphic determination of lighting effects.

Let m n be the photometric curve of a light-source L fixed upon a post LA of height h. Any point P of the soil is lighted by a ray of intensity equal to LC. If θ is the angle formed by the ray with the vertical, the lighting at P is—

$$e = \frac{\text{LC cos. } \theta}{\text{LP}^2} = \frac{\text{LC cos.}^3\ \theta}{h^2}$$

Draw through C the vertical CD, and through the point D a line parallel to LC. This parallel will strike at R the perpendicular to LC, drawn through C. It is easy to see that—

$$\text{KR} = \text{DR cos. } \theta = \text{DC cos.}^2\ \theta = \text{LC cos.}^3\ \theta$$

Then—

$$e = \frac{\text{KR}}{h^2}$$

To obtain the lighting at P, it is therefore sufficient to measure the length KR in the figure, and divide it by h^2. If one takes care for the trace of the photometric curve, to represent the unit of luminous intensity by a right line equal to h^2, the lighting is exactly equal to KR. Carry out this length in the vertical PQ. In doing likewise for other inclinations, and uniting in a curve the points Q so obtained, the result is the trace of a curve of lighting on the soil produced by a light-source of height h. To find immediately the lighting at a distance x from the foot of the lamp-post, it is sufficient to carry the length x from the point A, and measure PQ. If it is a question of determining the lighting at a point in a street or open space due to the combined effect of a cluster or number of lights, the above process must be carried out for every light, and the sum of the results taken.

M. Maréchal exhibits diagrams of the lighting curves of a typical Parisian thoroughfare to show the vast improvement due to the installation of Welsbach lights, which increase the minimum lighting fourfold with no addition to the expense, for the saving of gas pays for the mantles and up-keep. What he does not state—but it is perfectly true—is that a great recommendation of the incandescent lamp for street and roadway lighting, both in town and country, is the effect of reflection from the surface of the ground, which is conspicuously shown at low angles—enabling wayfarers to distinguish from lamp to lamp the character of the road surface over which they are passing. No such effect is noticeable with ordinary street-lamps.

Midland Association of Gas Managers.—We learn from the Honorary Secretary of the Association (Mr. C. Meiklejohn, of Rugby) that the annual general meeting will be held in Birmingham on the 25th inst. The President for the year is Mr. John Young, of Etruria.

A Project for Amalgamating the London Water Companies.—The Bill for amalgamating the London Water Companies, backed by Sir Frederick Dixon-Hartland, Mr. Bigwood, Mr. Howard, and Mr. Stephens, which, as already mentioned in the "JOURNAL," was introduced on the 22nd ult., has been issued. It proposes to control, amalgamate, and appoint districts somewhat on the lines of the Metropolis Gas Act, 1860. It is thought that by these means the ratepayers will be benefited without any burden on the rates, as, for example—(1) by ensuring against the possibility of any future water famine; (2) by reducing and equalizing the charges for water, and employing the surplus beyond a fixed income on the Companies' outlay in reduction of charges to consumers; (3) by removing the rival interests existing between river and outer circles.

The Edinburgh Appointment.—When our Scotch Correspondent despatched his "Notes" for to-day's "JOURNAL," the appointment of Gas Engineer to the Edinburgh and Leith Gas Commissioners had not been made; this having to be done at the meeting of the Commission yesterday. We learnt from him by telegram received in the afternoon that Mr. W. R. Herring, of Huddersfield, is the successful candidate; and that the vote was unanimous. On Friday last, the voting was equal for Mr. Herring and Mr. A. Wilson, of Dawsholm; but Lord Provost Macdonald, by his casting vote, turned the scale in favour of the former. A strong attempt was made yesterday to re-open the question; but it was ruled to be incompetent to go back upon Friday's vote. After considerable discussion, the appointment was confirmed. The salary proposed was £900 per annum—Mr. Herring to devote the whole of his time to the duties of the office. An amendment was submitted to make the amount £800; but it was lost by twelve votes to six. It was explained that many excellent men in Scotland and elsewhere had been disqualified on account of age. We offer hearty congratulations to Mr. Herring upon his success.

The Detection of Inflammable Gas and Vapour.—At a recent meeting of the Shipmasters' Society held at Gresham College, Professor Frank Clowes read a paper on "The Detection of Inflammable Gas and Vapour on Board Ships." He said that for this purpose the miner's safety lamp presented great advantages over electric hand lamps, which give no indication of a dangerous condition of the atmosphere. The ordinary oil-flame of a safety lamp showed the presence of inflammable matter when it was present in the air in too small a proportion to cause extinction of flame. The most delicate tests available, however, were furnished by substituting for the ordinary flame a pale one of hydrogen. The lecturer claimed that he had rendered it easily practicable to produce this flame inside the ordinary illuminating safety lamp, and to detect by it any quantity of gas from 6 per cent., which was the explosive quantity, down to 0·1 per cent., if necessary. One form of the appliance served to pump the air to be tested directly over the hydrogen flame, through a flexible tube. This was in use in gas-works, and for examining the air of sewers and electric culverts; but it was also perfectly suitable for making tests on board ships.

NOTES.

Deep Mining for Coal.

Mr. Brough has recently discussed the subject of mining at great depths, with regard to its bearing upon the question of the duration of the British coal supply. He was moved to broach the subject by the recent announcement that the Red Jacket shaft of the Calumet and Hecla mine in the Lake Superior copper region has been sunk to a depth of 4900 feet—the greatest depth ever reached by a mine shaft. The deepest shaft in the United Kingdom is that of the Ashton Moss Colliery, near Manchester, which has attained a depth of 2880 feet. The seams dip at the rate of 9 inches per yard, so that parts of the workings are vouched for by Mr. T. H. Wordsworth, of the New Moss Colliery, as being 3360 feet deep. Even this has been exceeded at the Pendleton Colliery, according to Mr. Israel Barker, the Manager, where an incline of 1 in 3 has been sunk to a length of 4700 feet from the bottom of the shaft, which is 1575 feet deep. The greatest vertical depth attained here is therefore 3474 feet. Many other deep shafts are more than 1800 feet, while the workings extend to upwards of two miles from the shaft. In Belgium, the Produits Colliery, at Mons, is 3937 feet deep. Other examples are cited to show that a great many of the difficulties which were formerly connected with the sinking and working of deep shafts have now disappeared. The valuable inventions and appliances available by mining engineers have rendered such sinking operations easy and comparatively inexpensive. Mr. Brough concludes, therefore, that no considerations of a mechanical nature need limit the prospective depths of shafts. The elements needing consideration are the decreasing capacity of the output of deep shafts, and the increase of pressure, temperature, and expenditure. The invention of wire rope, ascribed to Oberbergrath Albert, in Clausthal, in 1833, rendered deep mining possible. For very deep mining, pneumatic hoists are likely to take the place of ropes. The increase of temperature in deep mines is to be reckoned with. Mr. Brough concludes that as the shallow seams become exhausted, the rate of production will decline; and if the demand continues, the selling price must undoubtedly increase.

Smoke Dilution.

Mr. E. J. Duff, of Liverpool, has read a practical paper on the "Efficiency and Management of Steam-Boilers" before the Manchester Association of Engineers. Mr. Duff observed that his experience of mechanical stokers led him to believe that there is no money saving in the use of these appliances, excepting for cases where there are a number of boilers near together, and where the stoking apparatus is supplemented by coal elevating and conveying machinery. Otherwise the cost of repairs, depreciation, interest, &c., will generally overbalance any saving of labour or fuel. Mr. Duff severely criticized most of the smoke-consuming devices in the market, declaring that the majority should be called "smoke disguisers." Many of them introduce an excess of air to the furnace in various ways; and though the diluted chimney gases are rendered lighter in colour, the steam-user has to pay dearly for this form of smoke abatement. The black smoke complained of by sanitary authorities contains only from 0·25 to 0·50 per cent. of carbon, or smuts; and in order to disguise the presence of this carbon, the user of so-called smoke consumers is saddled with a loss of from 10 to 20 per cent. of his heat. This waste has to be made up by burning a correspondingly increased weight of fuel, which has its own smuts to contribute to the sum total discharged into the atmosphere; so that there is sent into the atmosphere for a given weight of steam raised, 10 to 20 per cent. more smoke with these so-called smoke consumers than without them. Smoke and smuts when once formed cannot be consumed by the addition of extraneous air without heat; but it can be, and often is, diluted in this way so as to assume that brown appearance which passes smoke nuisance inspectors. When studying the question some years ago, Mr. Duff came to the conclusion that, in order to really consume the solid carbon in the flame, a furnace must be so constructed as to maintain for awhile the initial temperature of the flame, to give time for complete combustion, to which end it is necessary to completely exclude secondary air. This, it may be observed, is Mr. Frederick Siemens's principle.

The Behaviour of Heated Columns.

Some remarkable results of experiments carried out by a Committee on Fireproofing Tests have been communicated to the Franklin Institute by Dr. S. Albert Reed. The idea of the experiments was to expose full-sized columns of iron and steel, such as are used in the structure of so-called fireproof buildings, to such heat as they might be supposed to be called upon to endure in a large conflagration. This temperature is very great—much greater than is commonly regarded as possible of attainment. In a particular example of a fire at a lard refinery in New York, Dr. Reed calculates that the temperature of the sheet of flame, which it was impossible to face at a distance of 200 feet, could not have been far short of 5000° Fahr. Of course, nothing could withstand such a temperature, which destroyed surrounding structures by simple radiant heat. Up to the present time, Dr. Reed has only been in a position to report upon the behaviour of unprotected iron and steel columns. So far as he is able to theorize in advance of his tests, he observes that iron or steel structural members ought to be protected by a sufficient thickness of non-combustible material, of slow heat-conducting qualities, and having mechanical properties which are not seriously altered by high temperatures. This protection must be mechanically attached, so that heat, falling objects, or water will not seriously impair it. The really important effects of the fire tests were not those commonly reported as occurring in conflagrations. Thus, expansion appears to be of minor importance among the agents of destruction. Dr. Reed does not believe that steel and iron members warp and twist under the action of heat, but that such twists as are observed to occur are due to the shock of the fall, the impact of other objects, and bending while loaded under heat. It was not found that throwing water upon red-hot cast-iron columns shattered them. As a matter of fact, cast-iron columns when red hot quietly bend like a lead pipe would do if used as a column; and steel does the same. When the bending heat is arrived at, many fine distinctions are obliterated—it makes little difference whether the columns are accurately bedded, or trued or plumbed, or whether the quality of the iron or steel is better or worse.

Street Subways.

The perennial street subways question interests American municipalities as closely as it does British local authorities. The difficulties attendant upon putting all the pipes and wires of different town supply services underground are everywhere the same. In March, 1892, the wires of the police and fire-alarm telegraphs were ordered to be put underground; and this was done in due course—terra-cotta conduits being employed. According to the last corporation report on the subject, all wires are to be carried in these conduits, which are carefully ventilated by compressed air blown into them from a central station. A similar question has been investigated by a Technical Commission appointed by the City of Washington, which has found that the favourite popular plan of a single subway in the middle of the street is unsuitable on account of its excessive cost, while it would not prevent the cutting up of the streets for making service connections. Where water, gas, and sewer pipes are yet to be laid, the Commissioners think that a double subway might be practicable—that is, a tunnel on either side of the street under the sidewalks. The ventilation of such tunnels is admittedly an important point; and though the system is very expensive, the plan of blowing in air under pressure is regarded as the only safe one. This is the method adopted in New York for all the electrical subways; and there has not been a serious explosion in the districts ventilated in this way since it was introduced. This information is given on the authority of the "Engineering Record."

Coke-Ovens in Germany.

At a recent joint meeting of the Midland Institute of Mining Engineers and the Chesterfield and Midland Counties Institute, a paper describing recent progress in the coke industry of Westphalia, by Professor L. T. O'Shea and Mr. G. Blake Walker was read by the latter. The paper was the fruit of observations made while on a recent visit to Germany. Mr. Walker stated that the Germans have, during the last ten years, made very great improvements in their coking-ovens; and the result is seen in a largely increased production both of coke and the bye-products, tar and sulphate of ammonia. Ten thousand coke-ovens are either at work or in course of erection in Westphalia alone. In England, the whole question of coking highly bituminous coals was threshed out years ago, when competent authorities concluded in favour of the retention of beehive ovens instead of retort ovens, for the reason that, on the whole, the greater yield of coke from retort ovens did not compensate for its inferior density and suitability for metallurgical purposes. Mr. Walker thinks that the position should now be reconsidered, inasmuch as the additional value obtained from the coal when the bye-products are recovered, throws the balance of advantage very largely on the other side. Mr. Walker's preference is for the Otto-Hoffmann oven—the one most largely used in Germany; though he does not think finality has been reached.

The Removal of Iron from Drinking Water.

The removal of iron from waters holding it in solution is in many localities a necessary operation. A paper on the subject was presented to the New England Water-Works Association by Mr. Harry W. Clark, the Chemist of the Massachusetts State Board of Health Experiment Station, Lawrence, Massachusetts. In the case of carbonates, Mr. Clark has found that simple aëration will remove the iron to a great extent. When the sulphate and other salts of iron are present, the removal is more difficult, and something more than aëration is required to effect this object. Filtration through marble chips will remove the iron; but it increases the hardness of the water. Great trouble has been experienced in taking out the iron from the water supply of Princetown, Massachusetts, which is derived from driven wells. Recourse was had first to aëration and sand filtration. Next filtration through iron filings and turnings was tried; the effluent being passed through a sand filter; and finally filtration through small gas coke or breeze. The last two methods—the use of the iron turnings and the coke—gave very good results; and has apparently been adopted for the permanent arrangement. This is of importance, as perfectly suitable coke for water filtration with the object of removing any kind of impurity is more easily obtainable everywhere than even reasonably good filtering sand.

TECHNICAL RECORD.

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of the Association was held on Thursday, at the Holborn Restaurant. Representatives from all parts of the extensive district now covered by the Association were present; but it is to be regretted that more of the recognized leaders of the defunct South-West organization could not make it convenient to attend the opening meeting of the first year's work of the combined Associations. The chair was taken at the commencement of the proceedings by the retiring President, Mr. A. F. Browne, the Engineer of the Rotherhithe works of the South Metropolitan Gas Company, whose only duty on this occasion was to induct into office his successor—Mr. J. W. Helps, the Engineer of the Croydon Gas Company.

Mr. Browne said the notion of introducing Mr. Helps, in any capacity whatever, to a meeting of the members of the Southern Association somewhat savoured of the ludicrous, because who did not know of the enthusiasm and self-denial with which he had served the Association for a considerable number of years? It would suffice for him to say that Mr. Helps was a man whom the Association delighted to honour, and from whose presidency they looked for great things. They would all join with him in giving their new President a hearty welcome to the chair, which he was competent to fill in the most worthy manner, and in accordance with the traditions of that chair.

The President, having taken the chair amid applause, thanked his predecessor for the very kind words he had spoken concerning him, and for the hearty manner in which the members had welcomed him.

The few items of formal business on the *agenda* were then disposed of.

On the suggestion of the President, the minutes of the autumn meeting were first taken as read.

Annual Report of the Committee.

The Hon. Secretary (Mr. D. H. Helps, of Croydon) read the annual report of the Committee, as follows:—

In presenting the twenty-third annual report of the proceedings of your Association, the Committee have pleasure in again drawing attention to a period of progress and usefulness.

The spring meeting was held on Feb. 20, when the President (Mr. A. F. Browne, of Rotherhithe), in his Inaugural Address, delivered a valuable contribution to the Association's literature, thoroughly sustaining its prestige and the author's ability and determination to elucidate all details connected with manufacture.

The usual excursion meeting took place on May 28, when about 45 members visited Leighton Buzzard, on the invitation of the Directors and Engineer of the Gas Company in that town.

After inspecting the works, which gave evidence of careful and energetic management, light refreshments were served. The party then left in brakes for Ascott, the seat of Mr. Leopold de Rothschild, whose Secretary, Mr. Tarver, received the members. Here an excellent luncheon was served; and afterwards the members enjoyed an inspection of the beautiful grounds. Yet another treat was provided in a visit to Mentmore, the seat of the Earl of Rosebery, whose representative, Mr. James Smith, kindly conducted the party through the grounds and gardens.

The Committee desire to most heartily thank all those gentlemen who so readily contributed to what will long be remembered as one of the most pleasurable excursions ever provided for the Association.

The autumn meeting was held on Nov. 12, when two papers were provided. The first was by Mr. W. E. Price, of Hampton Wick, on the "Residuals Market;" and it gave evidence of careful preparation, and some indication as to how the late depression in prices was caused. The other paper was on "Regenerative Furnaces for Small Gas-Works," by Mr. W. B. Randall, of Waltham Cross; and it bore testimony to results and energetic investigation in carbonizing that would do credit to the engineer of a much larger works. Both papers were well discussed, and will enhance the value of the Association's transactions.

At this meeting, the consummation of the scheme of amalgamation between this and the South-West Association was announced, with the consequent addition of 45 names to the list of members. Your Committee feel that this large influx must increase the vitality and usefulness of this Association, and beg to express the hope that each member will endeavour to add his quota to its accomplishment.

During the past year, two members have been lost by resignation, and one by death—Mr. Jabez Church, who joined in 1881.

The total membership is now 153.

The receipts have amounted to £52 10s., which, added to the balance brought forward of £46 7s. 10d., and the sum of £32 8s. 4d. received from the South-West Association on amalgamation, makes a total of £131 6s. 2d. The expenses have been £50 9s. 9d.; leaving a balance to be carried forward of £80 16s. 5d.

The Committee wish to express the indebtedness of the Association to their esteemed Honorary Secretary for his unfailing interest in its welfare, and to congratulate him on his election to the presidency.

The election of Mr. D. H. Helps to the Secretaryship ensures a continuity of efficiency in this department.

On the motion of Mr. T. A. Guyatt (Ely), seconded by Mr. J. H. Gray (Weston-super-Mare), the report was adopted.

Thanks to the Ex-President.

The President said it was his pleasing duty to propose that the hearty thanks of the members be given to their late President. They had had during past years a great many Presidents, all of whom they had esteemed; but he thought he could safely say—and he spoke for everyone present, and those who were not present—that in Mr. Browne they had had a President who had not only endeared himself to all of them, but who had raised the standard of their Association very considerably by what he had done during his year of office.

Mr. James L. Chapman (Harrow), in seconding the motion, observed that their late President had considerably enlivened their proceedings by the manner in which he had conducted the meetings during the year.

The motion was heartily agreed to.

Mr. Browne thanked the members sincerely for the cordial way in which the vote had been passed. In the eulogistic remarks the President had been kind enough to make upon his efforts in discharging the work of the office during the past year, he had been far too complimentary. It would not, however, be becoming of him (Mr. Browne) to dispute this point with the President; but he would content himself by asking the members to make a liberal discount. He thanked their President (who was then Hon. Secretary), the Committee, and the members generally for the kindly support and hearty encouragement they had given him during the period he had occupied the chair. There was one other point upon which his mind dwelt with undiluted satisfaction. It was this, that whereas twelve months ago he was to many of the members almost a stranger, he could not now attend the meetings without finding himself surrounded by a host of friends—not only professional, but personal—with whom he hoped to be associated for many years to come in the bonds of fellowship, and for the good of their organization.

New Member.

On the proposition of Mr. W. Woodward (Bromley), seconded by Mr. Levi Monk (Lewes), Mr. J. Morris, the Secretary and Engineer of the Jersey Gas Company, was elected a member of the Association.

The President then proceeded to read the following

INAUGURAL ADDRESS.

Naturally, on rising to address you, my first duty must be to express my sincere thanks for the honour you have done me in electing me as your President; and this honour I more fully appreciate from the fact of my being the first President elected since the amalgamation with the South-Western District Association of Gas Managers.

During the time that I had the honour of acting as your Secretary, it often occurred to me that it was a trifle unfair to the President to elect him in the November of one year, and to expect him to deliver an address in the following February, when almost at the height of his busy season. I was not then anxious to propose any alteration, as I thoroughly appreciated the fact that, if the Presidential Address were to be delivered at the November meeting, the necessary papers for discussion would have to be ready in February; and I foresaw only too well what a ready excuse would thus be placed in the hands of those to whom I might apply for contributions. In my altered position, I only regret that my selfishness prevented me from doing more in the past to bring about the suggested change.

Let me at once express my regret that I cannot, in my address, pretend to lay before you either the results of any novel experiments or information respecting the working of any new processes which have been lately introduced. My apology must be that I have been too much engaged with extensions and alterations to devote the necessary time to experimental work. I must therefore content myself with briefly alluding to one or two matters which have engaged my attention during the past year or so, and this more with the object of leading up to what I consider the real subject matter of my address, than with the idea of throwing very much light upon the difficulties to which I shall refer.

I must confess that some of my chief troubles have been due to stopped ascension-pipes and thick tar in the hydraulic mains; and this I am somewhat loath to do, inasmuch as, until within the past two or three years, I have always felt inclined to think but lightly of these (to me supposed difficulties), and to regard with a feeling of superior sympathy those who were compelled to acknowledge them as real. My time, however, came; for in the winter of 1894-5 we commenced work in a new retort-house fitted with regenerative settings and manual stoking machinery. Prior to this time, we had been accustomed to the use of directly-fired settings, and of the shovel for charging purposes; and, though working with decidedly high heats, we knew nothing of the troubles to which I refer.

At this point I should like to give a few details relating to an experiment which has been carried out with the object of throwing light on the cause of the trouble. Starting, as we did, two systems both new to us, at the same time, it was naturally somewhat difficult to decide as to which, if either, was answerable for a state of affairs so utterly at variance with our previous experience. To assist us in solving the question, we selected a setting of retorts which had proved itself particularly troublesome with regard to stopped pipes and thick tar; and for a time worked this setting at a temperature distinctly higher than its fellows. But instead of charging by means of the machine, the work was carried out with the shovel; and this formed practically the only difference. The result was that within twelve hours of the change, the tar, instead of requiring frequent assistance,

flowed from the Livesey and Tanner overflows as smoothly as it was wont to do in our older houses. In addition to this, from the first day of the alteration until the end of the time the trial lasted, not a single stopped pipe was reported.

The previous system was then reverted to; and with it returned the previous troubles. To me this appeared to prove that our difficulties were not entirely brought about by the higher temperature of carbonization, but that they were influenced by one or both of two causes—the first (a well-recognized one) being the longer period during which the gas evolved was allowed to remain in contact with the hot retort; and, secondly, the fact that with stoking machinery the lid is closed so quickly that most of the dust, which with shovel charging escapes into the air, has to find its way up the ascension-pipe. Now there is no doubt that with the shovel somewhat more coal was introduced into the retort than with the machine scoop; for with the latter we have always found it difficult to exceed a charge of about 2·9 cwt. per mouthpiece, with Ω-shaped retorts, 22 in. wide by 16 in. high. If an attempt were made to exceed this amount, difficulties arose as to the proper action of the scoop, and also as to the easy introduction of the rake for the removal of the coke, notwithstanding the fact that various forms of rake-heads had at different times been tried. With the larger charge there is, of course, less space above the top of the coal; the gas is therefore compelled to travel to the ascension-pipe at a greater rate than with the machine-charged retorts; and consequently the period of contact with the heated surface is shortened.

With regard to the second cause, it must be remembered that, with the old system of working, the coal after delivery into the store is as a rule handled but once, or at the most twice; but with machinery, it has first to pass through the breaker into the boot, from thence it is conveyed by the elevator to the store-hopper, and so on to the charging machines, from which it is ground out into the scoop. The natural result is that it contains a very large percentage of fine dust. Yet from the time the first scoop enters the retort till the moment the lid is closed, only some 20 to 25 seconds elapse; while with shovel charging, a less quantity of dust has about six times that period available for escape into the air. I should add that I afterwards tried the experiment of leaving the lids open for about a minute and a half after the coal had been inserted by machinery, with the result that decidedly improved results were obtained in the hydraulic main.

I may also refer to another difficulty closely allied to the one I have mentioned. At certain times, we have been able to produce all the gas required in our machine house; and during such periods, we frequently experienced trouble with our purification. The system on which we work is that known as the "rotation principle;" the gas being first passed through four large boxes containing lime, and then through boxes of oxide acting as catches. Occasionally we noticed a very considerable rise in the sulphur compounds—a condition of affairs by no means set right by bringing fresh lime into use. At these times, our tests showed that carbonic acid was travelling practically side by side with sulphuretted hydrogen; and our difficulty therefore lay in the fact that we were unable to produce an active sulphide of calcium in any portion of our system.

It was noticeable that these troubles coincided with the production of thick tar in our retort-houses; and there is no doubt that the frequent removal of the plugs in the hydraulic main, to allow of means being adopted to clear it, admitted a quantity of air sufficient to give rise to the troubles to which I have alluded. Of course, from time to time steps have been taken to improve matters; but so far I must regretfully confess that I have not been successful in what must obviously have been my desire—namely, to remove the *cause* of the trouble. And here I cannot help remarking that it appears to me that, if the amount of care and attention devoted to the overcoming of evil results when they arise were given to the careful study of the initial causes, more satisfactory results would be arrived at; for it would certainly be far preferable to avoid the formation of thick tar than to devise even the most ingenious methods of removing it when once produced.

In connection with the manufacture of sulphate of ammonia, there are several matters which have engaged our considerable attention, among which I may mention the occasional formation of blue sulphate. This, I cannot help thinking, is partly brought about by the carrying forward of tarry or other matters in an excess of moisture with the ammoniacal gases from the still; and I say this because, by the interposition of a larger catch-box, with a dash-plate of considerably increased area, I have been able to greatly reduce the trouble. I must, however, admit that I find that the formation of this blue salt is also sometimes noticed when the specific gravity of the solution in the saturator falls below a certain point. A second difficulty has also been experienced in dealing with the condensed liquor from the foul gas—appropriately termed "devil liquor." This we have at times returned to the top of the still; but it is usually allowed to flow back to the wells—the result being that the ammoniacal liquor is so greatly reduced in strength that both the apparatus and store-tanks must be of far greater capacity than would be otherwise necessary.

I should like here to allude to details, which Mr. Broadberry has very kindly given me, of the process adopted in dealing with this liquor at Tottenham. His treatment is based on the assumption that the characteristic odour is due principally to the presence of sulphuretted hydrogen; and also upon the fact that the solubility of this gas decreases rapidly with the rise in temperature of the liquid to which it is exposed. The method is a very simple one, and consists in drawing off the cool liquor from the end of the condenser, and returning it at a point immediately after the superheater, where the action of the hot gases causes it to give up a considerable portion of its sulphuretted hydrogen, which passes forward to be dealt with according to circumstances. The hot liquor, which is eventually allowed to run away, is, as the following figures will show, nearly free from the above impurity; and in this condition, it is run into the settling-tanks, where the excess of lime in the spent liquor from the stills deals with any remaining traces.

Particulars of Working.—Feb. 4, 1897.

Daily make of sulphate	22 cwt.
Temperature of waste gases at outlet of superheater	207° Fahr.
Hot Liquor.	
Temperature	194° Fahr.
Flow per 24 hours	691 galls.
H_2S dissolved per gallon	0·018 cub. ft.
Cold Liquor.	
Temperature	43° Fahr.
Flow per 24 hours	211 galls.
H_2S dissolved per gallon	0·25 cub. ft.

The disposal of the effluent liquor from our stills forms the subject of a further difficulty. Our usual custom is to collect this fluid in settling-tanks, from whence, when cooled, it is allowed to percolate through the gravelly soil of our works, and finally to find its way into the wells from which our supply of water for many purposes is obtained. Anyone who has adopted a similar course, must be aware of the many objections which may be raised to it, not the least of which is the difficulty in keeping the rods and other working parts of the pumps in good order.

Lately we have made application to the local authorities for permission to run this liquor, after cooling and settling, into the sewers which convey the sewage to the irrigation farm. As yet no decision on the point has been arrived at; but I may say that, in order to strengthen our application, we have had samples of the fluid, both in its concentrated form (B), and also after admixture with the surface water (A), forwarded to Dr. Percy Frankland, together with a full statement of the conditions under which our application was made, and I have his permission to give his report on the results of his investigations. Dr. Frankland writes:

In accordance with your wish, I have examined the two samples of spent liquor "A" and "B," with a view to ascertaining whether they may be safely admitted into a sewer carrying treated sewage on to irrigation works.

Both liquors are alkaline, and contain a large amount of solid matter, and some ammonia in solution. On heating the solid residue, it emits in both cases—but especially in "B"—an aromatic odour; and the liquor "B" itself smells distinctly of coal-tar products. Both liquors, but especially "B," also give strong reactions for phenol or other tar acids.

Both liquors—and especially "B"—therefore, obviously contain ingredients which are *in themselves* detrimental to vegetation; but the only question of importance is whether the proportion in which these substances are present is sufficient to produce injurious effects when diluted with the large volume of sewage with which it would be incorporated.

To put this to the test of actual experiment with ordinary vegetable life would obviously involve the use of a large quantity of liquor and an investigation extending over many months. I have, however, devised a method of putting this matter to the test in a novel manner, by ascertaining the action of these liquids on those low forms of vegetable life known as bacteria. This method of investigation has appeared to me the more important, in view of the circumstance that the principal source of danger in applying such liquids to the land would be the possibility of their sterilizing the soil—*i.e.*, destroying those bacteria in the soil which are indispensable to its fertility.

The mode of experiment adopted was the following:—

The liquors "A" and "B" were first examined for bacteria by gelatine plate cultivation, with the result that "A" was found to contain an abundance of bacteria (353,000 bacteria in 1 cubic centimetre); thus clearly showing that "A" cannot be highly prejudicial to bacterial life. "B," on the other hand, was found to be quite sterile, or free from bacterial life; showing therefore that in its concentrated state it would be injurious to vegetable life.

It does not, however, follow that it would be injurious to such life when adequately diluted.

To put this matter to the test, an ordinary water (which I will call "C," and which contained a large number of bacteria) was treated with definite quantities of "A" and "B" respectively; and on the following day these mixtures were submitted to gelatine plate cultivation, to ascertain whether the additions of "A" and "B" had destroyed any of the bacteria. In your letter of the 2nd inst., you state that about 15,000 gallons of liquor would daily be admitted into several million gallons of sewage. That would mean, say, a dilution of 1 in 67. In my experiments, I have diluted "A" and "B" with the water "C" in the proportions of 1 in 50, and 3 in 50 respectively; but in every case, instead of the addition of "A" and "B" having impaired the vitality of the bacteria in the water "C," it has greatly stimulated their growth and multiplication. The results are, in fact, so striking and conclusive that I am of opinion that if these liquors are diluted to the extent you mention, far from their being injurious to vegetation, they will actually be of considerable manurial value.

In order to prevent the liquor reaching the land in too concentrated a state, it is desirable that its discharge should be uniformly distributed over the 24 hours; or it would probably be better to restrict its discharge to those hours of the day when the flow of sewage is at its maximum.

Results of Bacteriological Experiment.

Sample of liquor "A" contained 353,000 bacteria in 1 c.c.
Sample of liquor "B" contained 0 bacteria in 1 c.c.
Sample of water "C" contained 199,000 bacteria in 1 c.c.
50 volumes of water "C" + 1 volume of liquor "A," after standing 23 hours, contained 1,015,000 bacteria in 1 c.c.
50 volumes of water "C" + 3 volumes of liquor "A," after standing 23 hours, contained 1,397,000 bacteria in 1 c.c.
50 volumes of water "C" + 1 volume of liquor "B," after standing 23 hours, contained 1,032,000 bacteria in 1 c.c.
50 volumes of water "C" + 3 volumes of liquor "B," after standing 23 hours, contained 1,423,000 bacteria in 1 c.c.

Had I the time, I should like to refer at some length to the very interesting correspondence which has appeared in the pages of the "JOURNAL OF GAS LIGHTING" on the subject of Coal Gas Enrichment, between Mr. William Young, of Peebles, and our esteemed ex-President, Mr. A. F. Browne, of Rotherhithe—both of whom must be heartily congratulated on the parts they have borne in the controversy. I must, however, content myself with observing that the uncertainty which prevails on this question is a point which must not be lost sight of when considering the suggestions which will be contained in the latter portion of my remarks. But, in this connection, I cannot refrain from saying that we owe Mr. Browne a debt of gratitude for having, during his year of office, brought our Association so profitably and honourably to the front by his action in the matter.

I presume that a presidential address would scarcely be considered complete without some reference to the electric light; and inasmuch as in the town which I have the honour to represent, an installation has but lately been inaugurated, I think it may be of some interest if I give a few particulars as to the terms upon which the supply of electricity has been arranged, especially as I believe these terms are somewhat novel.

The Electric Lighting Order of the Croydon Corporation was obtained in the year 1891; but under the Act no definite steps were taken until early in the year 1895, when the authorities decided to employ as their adviser Professor Kennedy, and advertisements were issued inviting various well-known firms to tender for the lighting of the town upon an agreement, some details of which I herewith submit.

The successful contractor engaged himself to supply all plant and machinery at his own cost, for which work the Corporation were to pay a sum of somewhat over £19,000, in amounts based upon the certificates of the Consulting Engineer. The Corporation were at liberty to retain from these various payments during the progress of the work, 50 per cent. of each amount until a guarantee fund should be provided for; and after this, 10 per cent. of the amounts of the subsequent certificates. A sum of £8250 was to be paid to the credit of the guarantee fund; and the remainder was to be retained by the Corporation until the completion of the works as certified by the Engineer. The contractor had to maintain and work the whole of the plant, &c., at his own expense and responsibility, for a period of not more than ten years; and he was entitled for his own benefit to the revenue derived from the installation during this period at a charge not exceeding 6d. per Board of Trade unit. During the said period, the contractor engaged to pay to the Corporation a sum equal to the annual amount which, until the expiration or determination of the above period, the Corporation shall have from time to time to provide by way of interest and sinking fund, under the terms on which the loan had been sanctioned by the Local Government Board (but not together more than 6 per cent. per annum) in respect of the sum raised by the Corporation to meet the expenses of the installation, &c., which shall not exceed a total sum of £27,500. The sums payable by the contractor, as secured by the guarantee fund previously mentioned, were to be equal in the aggregate to the sums which shall become payable by the contractor to the Corporation under these arrangements during the period of working. The guarantee fund was to be invested, and the interest or dividends to be paid to the contractor. The Corporation had the power of determining the said period of working, and of taking over the installation and maintenance at the expiration of any year, upon giving the contractor six months' previous notice. Provided that if the Corporation should determine the said period before the expiration of the first five years, they were to pay to the contractor £1000 if at the expiration of the first year; £800 if at the expiration of the second year; £400 if at the expiration of the third year; and £200 if at the expiration of the fourth year. In the event of frequent complaints as to unsteady lights, or excessive or insufficient voltage occurring, and appearing to the Corporation to be justified and sufficiently serious, the Corporation had power to determine the agreement by giving one month's notice, and to take the station under their charge at its expiration. The contractor was to be responsible for all damage, &c., in consequence of his default. At the termination, all plant, machinery, supplies, &c., were to be handed over to the Corporation in good working order, fair wear and tear excepted. The electrical energy was to be supplied by alternating current at a pressure of 2000 volts, with transformer supply stations connected to a network of low-tension mains on a two-wire system, the pressure at consumers' lamps to be 200 volts. It was also provided that arrangements should be made for transforming a part of the current to a continuous current for the purpose of charging batteries.

The work of supplying indoor lighting was commenced early in the autumn of last year; but the arc lights in the streets were not brought into action till the middle of November. Under these circumstances, I am, of course, unable to give any details as to the success or otherwise of the working. All I can say is that, while I have not heard any complaints as to the success of the indoor lighting, it must be admitted that up to the present time the street lighting cannot certainly be described as a success.

A few months ago, we were requested by the Corporation to state the terms upon which we should be willing to light a considerable portion of the town by means of incandescent burners; and after some discussion an agreement was entered into whereby we engaged to provide the burners and do all necessary work at an increase of 4s. 6d. per lamp above the ordinary price—this figure being arrived at upon the belief that a saving of 1 cubic foot of gas per burner would be effected. I have heard it stated by many managers that this saving is partly an imaginary one, and that the governors fitted to the incandescent burners are so little to be relied upon that the 4 cubic feet an hour for which the governor is regulated is, nine times out of ten, considerably exceeded. Inasmuch, however, as it is our custom to adopt a similar governor set to 5 cubic feet per hour for our ordinary street lighting, I consider that a like result should arise in both cases; and that if the 4 cubic feet governor exceeds its prescribed rate, the same may be expected with the one regulated to pass 5 cubic feet.

I may say that at present we have about 500 of these incandescent burners in action; and I am constantly receiving expressions of satisfaction as to the improved results both from private citizens and members of our Corporation. I cannot, however, say I consider that, even with incandescent burners, we have reached anything like perfection in street lighting—especially where, as in the town of Croydon, the lamp-posts are placed at an average distance apart of from 80 to 120 feet; nor, in my opinion, has any inexpensive and satisfactory method been devised for insuring a fair lifetime to the mantles employed. I may, however, remark that since I discarded the use of chimneys in favour of burners fitted with bulbs, &c., I have obtained considerably better results. In addition to this, experience has tended to show me that the chief cause to which the breakage of the mantles is due is the jar or vibration conveyed to them through the agency of the service-pipe; and by making the burner a fixture in the lantern, I have been able, by means of a piece of flexible tube, to connect it to the service-pipe in such a manner as to absorb most of the vibration, and thereby lengthen the life of the mantle.

In common with other managers, it has unfortunately been my lot to occasionally receive complaints as to the illuminating power of our gas; and these complaints have certainly not ceased since the adoption of the incandescent burner for domestic purposes. I think the reason for this is to be found in the fact that the illumination of such rooms as are provided with these burners forms such a marked contrast to that of other rooms where ordinary burners are in use.

Now, it will be noticed that, in several of the matters to which I have referred, I have not suggested remedies for the many difficulties experienced in connection with them; and this leads me to the consideration of the subject which I have previously referred to as forming the most important portion of my address. I have long felt that Associations such as ours have not done the work of usefulness which might reasonably be expected of them. To meet three times a year, to listen to a presidential address, to read and discuss certain papers, to visit the works of one of our members, and to distribute copies of the transactions of the various Associations—can scarcely be described as a particularly high standard of usefulness, nor as doing a fair share towards furthering the interests of the great industry of which I think it must be acknowledged the Southern District Association of Gas Engineers and Managers represents by no means an insignificant part. I do not for one moment desire to depreciate the value of our meetings; for even if no papers were read, and no address delivered, I believe that the opportunities given for the interchange of opinions and for comparison of results, would more than justify the existence of our Association. I am aware that, wide-spread as are our members, it is quite impracticable to add to the number of our gatherings. If our members resided within a smaller radius, I should be inclined to very strongly support the suggestion which has already been made as to the establishment of a centre, at which a reading-room and library might be formed, and where informal meetings might be held at more frequent intervals. Although this is, I am afraid, somewhat difficult to carry out, I am of opinion that much good might arise if such an addition were made to our Association, with, of course, a further optional subscription, and a separate Committee of Management. I think, however, we must turn our attention in another direction, if we desire to formulate a scheme which shall be common to the general body of the members, and useful to the industry at large.

It is, as most of you are aware, a matter of considerable surprise to "laymen" when conversing with gas managers on the more usual difficulties experienced in the ordinary business of gas routine, to find that, taking into account the number of intelligent men engaged in the industry, many of these difficulties are not much nearer solution than they were twenty or

thirty years ago, and that in many cases parts of our plant, by no means perfect, exist in almost the same form as they did very early in the century. No doubt, the great difficulty in connection with this matter is that we are all working in something of a groove produced by years of travel over the same ground; and we find it far from easy to forget what has been done before, and so strike out for ourselves fresh lines on which to work in our attempts to bring about the desired end.

Is it not strange, for instance, that the naphthalene difficulty should be almost as far from solution as it was in the earlier days of gas making; and that, in the year 1896, the gas press should be asked to print letters from managers begging for assistance in the matter of the prevention of stopped pipes? Also that one gas manager is able to assist his purification by the admission of over 3 per cent. of air, and yet to produce 10,500 cubic feet of gas of an illuminating power of 16 candles; while another, with a similar coal, and with apparently identical working, finds it impossible to exceed 10,500 cubic feet of 15-candle gas, when admitting only 1 per cent. of air. That "A" can add two candles to the illuminating power of his gas by the return, at a certain point, of a measured portion of purified or semi-purified gas; while "B," after trying a similar process with endless variations, is unable to obtain anything like such results, and sometimes even the reverse. That in one gas-works a gallon of petroleum spirit is capable of adding four times as much enrichment to the gas as it is found to do in another, although its actual theoretical value is not unlikely obtained in the latter case. Are not these results, and many others which might be mentioned, matters for considerable surprise; and is it not time that something should be done towards providing better means for their fuller and more thorough investigation?

It may be remembered that some time ago I advocated the establishment of experimental gas-works, to be worked on ordinary practical lines, but under the control of a governing body consisting of men well acquainted with every branch of the industry, and at which works matters of interest could be investigated, with every advantage which proper means, science, and intelligence could provide. From the silence with which the suggestion was received, it is evident that it was considered either impracticable or useless; but now that I have the opportunity of further referring to this suggestion, I think you cannot be surprised at my taking advantage of it, and expressing slightly more in detail my own ideas on the subject.

May I, at the outset, say that there are some 126 companies represented by the members of our Association; and in these undertakings £9,000,000 of capital is employed, and 1,350,000 tons of coal carbonized annually, which figures are raised to £24,000,000 of capital, and 4,160,000 tons of coal if The Gaslight and Coke and the South Metropolitan Gas Companies are added.

Now although, in the first instance, I had in my mind experimental works to represent the whole of the companies in the United Kingdom, I have come to the conclusion—after considering the above figures—that it would be better to confine the movement to that portion of England represented by our Association, especially as conditions of working vary to such a considerable extent in the North and South. I need scarcely refer to the legal difficulties which would naturally be experienced in getting possession of a small works, or in the building and starting, as a going concern, of works which could supply gas for public purposes. It is possible that a Special Act of Parliament might be required; but even if this were necessary, it should certainly form no insuperable difficulty. One thing is, of course, obvious—namely, that there shall be a regular outlet for the gas produced. In the case of the purchase of a small gas-works as a going concern, this requirement is naturally fulfilled. But if a special works were erected, it would have to be placed on the outskirts of the district of a larger company, to the mains of which the gas could be passed (after proper measurement) to be paid for at a price to be agreed upon; and I do not think any great difficulty should be experienced in coming to some satisfactory arrangement whereby this could be done. It would be necessary in this case to isolate a certain portion of the district in which such experiments as those connected with the carrying power of the gas, &c., might be conducted; while, if desired, a self-acting governor could be fixed at the junction of the two systems, to act as a safeguard in case of an accident.

Now, of course, the amount necessary for the erection of works of a suitable capacity would greatly depend upon which (if either) of the suggestions I have made, were adopted. But assuming the sum of £20,000 to be required, this would represent but 3¼d. per ton of coal carbonized, which would be reduced to slightly over 1d. per ton if the two Metropolitan Companies were added. Now I fail to see any reason why a fair dividend should not be earned on such a capital sum as the one I have mentioned; for independent of the revenue produced by the sale of gas, I feel confident that many other means of adding to it would be found—such, for instance, as the fees derivable from the testing of new processes or appliances, and possibly of various materials such as coal, oil, &c.; for surely a certificate of merit granted under such exceptional circumstances would be worth paying for at a price remunerative to the Company.

Assuming such a concern to be established, its management would be placed in the hands of a Board of Directors, elected by our Association, whose duty it would be to engage the services of a suitable staff, to meet at fairly frequent intervals, to decide on the character of the investigations to be carried out, and generally to regulate the working of the Company. With regard to the staff, having once appointed a thoroughly qualified manager and chemist, I do not think that much difficulty need be felt, or expense incurred, in obtaining the necessary assistants; for I believe the chances afforded of studying both the theory and practice of gas manufacture under such favourable auspices would lead to a considerable demand for any vacant positions from young men anxious to identify themselves with the profession. This prompts me to express a hope that, if such works were established, it might eventually lead to the formation of a Technical School for the study of matters either directly connected with, or nearly allied to, the gas industry.

A short time ago Sir Philip Magnus, in delivering an address at the Bolton Technical School, referred to his recent visit to Germany in company with Mr. William Woodall and two other members of the Technical Institution Commission. In this address, Sir Philip Magnus inclined to the belief that it was neither any difference in the rate of wages nor in the hours of labour, which enabled German enterprise to hold undoubted prominence throughout the world, inasmuch as wages in Germany are very nearly, if not quite, as high as in England, while, though the working day is somewhat longer than in our own country, yet the shortening of hours is rapidly extending in Germany, as both inspectors and managers hold the opinion that the cost of production is not increased by so doing. Sir Philip Magnus, therefore, arrived at the conclusion that the reason for the prominence of the Germans is to be found in their "faith in education," and in their belief that the "school forms the necessary adjunct to the factory." After instancing the school of Berlin, built at a cost of £450,000, that at Darmstadt (a place of only 57,000 inhabitants) which cost £120,000, and the Supplementary Chemical and Physical Institute at Stutgart, upon which £80,000 has been expended, he proceeded to remind his hearers that, while the first colouring matter from coal tar was produced by an English chemist, yet by their ready supply of experts the Germans were enabled to appropriate to themselves this important industry; and he stated that in one factory alone which he visited, one hundred trained chemists are now employed, occupied in experimental work, with a view to still further improving the process of manufacture.

It is true that, under the City and Guilds of London, certain examinations are annually held in connection with gas and coal-tar matters, and that in a few colleges facilities are given for the study of such subjects; but all that has been done is the result of no effort on the part of those directly connected with the gas industry, who have so far taken but little interest in the educational movement. Gas companies have long ceased to hold the monopoly in lighting which, rightly or wrongly, they may have laid claim to in years gone by; for at the present time our industry has several powerful competitors. Of these, I need only mention one—viz., the electric light, upon which there is centred probably more intelligence and energy than upon any other invention of the present century. Shall it be said that the profession of a gas engineer is one which requires no special training or education, and one upon which continued scientific research would be thrown away?

Now, if it be thought that the establishment of such experimental works is too bold a scheme, I still believe there is yet another way in which our Association could lend a helping hand to the industry, and thereby more fully justify its existence.

I feel sure that, for many reasons, the careful examination of processes and appliances could often be better carried out in small works, where the whole plant could be devoted to the experiment, than in large ones, where, as a rule, a portion only can be utilized for such a purpose. The drawback, however, is that, though the managers of the smaller works may have time and opportunities for carrying out investigations, the smallness of the concerns they govern will scarcely admit of the appointment of properly qualified chemists, nor of the purchase of the requisite apparatus and materials. How easily this objection could be overcome, if our Association were to employ its own Chemist and assistants, to be at the service of the members and to act under the instructions of a carefully appointed Committee, with a paid Secretary whose duty it would be, *inter alia*, to tabulate the various results, and to formulate reports thereon which could in due time be communicated to the members. Under such circumstances (although this, of course is but a minor point), I do not think that there would ever be any anxiety in the mind of the Hon. Secretary about securing sufficient material for discussion at the annual meetings.

With regard to the cost of carrying out this latter scheme, let me say that, if each Company, exclusive of those in the Metropolis, were to contribute annually an amount equal to ¼d. per ton of coal carbonized, the sum of nearly £1500 would be realized; and this would probably be sufficient to meet all requirements. I bring forward this proposal somewhat in the light of an alternative which, if adopted, might prove the thin end of a wedge, which I trust would open out further developments upon the lines I have previously sketched. I am quite prepared to be met at the outset with the objection that even if we as members were to declare ourselves in favour of one or other of the suggestions I have made, its carrying out would not depend so much upon ourselves as upon the will of the Directors, and possibly of the shareholders of the Companies under our management. The

truth of this I cannot deny, nor do I think that any such scheme as I have laid before you could be brought to a successful issue without numerous difficulties being encountered. Nevertheless I hold the opinion that if the advantages of the suggested movement could be appreciated, and after careful discussion and consideration could be concisely and intelligibly laid before our Directors, there should not be very great difficulty, at any rate in the majority of cases, in getting them to come to the same conclusions as those previously arrived at by the men whom they have entrusted with the technical management of their affairs.

My task is now ended, and I can only regret that I have been unable to lay before you matters of more scientific interest, but have chiefly confined myself to the consideration of the educational aspect of an industry with which I am proud to confess I have been connected throughout the whole of my life, and for which I have every confidence in predicting a career as successful in the future as has been vouchsafed to it in the past. Let me, therefore, conclude by thanking you for the kind and patient attention you have given to what I fear most of you must consider my all too lengthy remarks.

Mr. T. May, jun. (Richmond), moved a hearty vote of thanks to the President for his interesting address. They had, he said, expected a good deal from Mr. Helps; and he (the speaker) was quite sure he was echoing the feeling of all the members when he said that they had not been disappointed. Though it was not the custom to discuss presidential addresses, he might say that the President's investigation with regard to stopped pipes in dealing with coal by machinery was somewhat of an "eye-opener" to most of the members. The chief part of the address was, of course, that in which he spoke in favour of the establishment of experimental gas-works. He (Mr. May) was sure the suggestion deserved their full consideration; and he hoped it would bear fruit.

Mr. C. C. Carpenter (Vauxhall), in seconding the motion, said they had been charmed with the President's address, because Mr. Helps was an idealist in all things. He had proved himself in the past to be an ideal Secretary; and now he had given them an opportunity of judging that he had in him the making of an ideal President. When the address was published, they would read it with a great deal of pleasure and profit.

The motion was carried by acclamation.

The President, in reply, assured the members that he thoroughly appreciated the very kind words that had been spoken by the proposer and seconder of the vote, and the hearty way in which the members had endorsed their remarks. He could only repeat what he had said in his address—how greatly he regretted he had not had an opportunity during the past year of carrying out some experimental work that would have given him something for his address more worthy of being listened to by the members than that with which he had presented them. He also heartily welcomed the members present who had become associated with them by the amalgamation of the two Societies.

This concluded the business; and shortly afterwards the members dined together.

BRITISH ASSOCIATION OF WATER-WORKS ENGINEERS.

A General Meeting of the Association was held on Saturday, at the Westminster Palace Hotel. The President (Mr. D. M. F. Gaskin, M.Inst.C.E., of Nottingham), who has only recently recovered from a severe illness, was in the chair; and there was a muster of about forty members.

The Secretary (Mr. H. W. Brothers) first submitted the minutes of the annual meeting held at Nottingham in July last; and they were confirmed.

The Queen's Reign.

The President then proposed—"That a loyal and dutiful address be presented to Her Most Gracious Majesty the Queen on the completion of the sixtieth year of Her Majesty's glorious and beneficent reign."

Mr. H. Ashton Hill (South Staffordshire Water Company) seconded the motion, which was unanimously agreed to.

A Committee consisting of the President and the two Vice-Presidents (Messrs. Ashton Hill and Matthews), was appointed to consider the arrangements to be made for the presentation.

Finances.

Mr. W. Terrey (Sheffield) submitted the Auditors' report as to the accounts. It is gratifying to learn that he is "very pleased" with the financial position of the Association. The receipts were somewhat inflated by subscriptions during the year; and the expenses were necessarily a little heavy in consequence of initial payments.

Additions to the Roll.

The following gentlemen were admitted to the Association:—

Members: F. I. Bancroft, Hull; C. E. Bland, Colchester; W. T. Curry, Newport; H. Dearden, Dewsbury; W. C. Finch, Luton, Chatham; A. J. Howard, Eastbourne; E. A., Lees, Birmingham; F. S. Lynch, Kimberley; J. O'Keeffe, Cork; J. Robarts, Kimberley; E. A. Whitehead, Broken Hill, N.S.W.; E. T. Hildred, Southampton; and E. W. Waite, Barry.

Associates: W. Bennett, Harrogate; J. Bryce, Glasgow; A. Hindle, Blackburn; D. H. Irwin, Manchester; J. P. Jenkins, Swinton; S. F. Sainty, West Hartlepool; A. H. Settatree, Snodland; H. W. Ware, Maidstone; J. Vivian, St. Bees.

Drainage Areas, Compensation Water, Etc.

Mr. W. Watts (Oldham) read an interesting paper, in which he dealt with the above among other subjects. A summary of the communication, and of the long and vigorous discussion to which it gave rise, will be published in a subsequent issue.

Time would not admit of the discussion of the resolutions standing in the name of Mr. J. A. Paskin (*ante*, p. 231); and they were therefore postponed to the annual meeting.

The President was thanked for his conduct in the chair; and the proceedings terminated.

ARTIFICIAL ILLUMINATION.

A Lecture on the above subject was delivered last Saturday evening, in the Engineering lecture-room of the Goldsmith's Institute, by Mr. G. P. Lewis, of Sydenham, the President of the Gas Engineering Society. It was evident that, to the preparation of the material for his lecture, Mr. Lewis had given considerable attention and study; and in elucidating the more technical points of the subject, he produced a number of clear diagrams.

The lecturer briefly touched upon the early methods of artificial illumination; and, coming to existing systems, he generally described the system of incandescent gas-lighting, and then the manufacture of acetylene. His audience being to a large extent composed of students, he did well in cautioning them against the use of some of the generators which have been devised for the production of the latter. The Patent Office, he remarked, had almost been besieged by inventors of acetylene generators, which were, in many cases, likely to prove dangerous in practice.

The next section of the lecture was devoted to the consideration of the thermal and lighting efficiencies of various sources of illumination, with the view of indicating that both electricity and gas waste a large amount of energy in producing heat rather than light. A great mass of information was given to show the small proportion (1) of the theoretical heat units in the original coal which are available at the source of light, and (2) of these units which are transformed into light. Mr. Lewis took as a basis for comparison 100 lbs. of coal, which is capable of producing 1,500,000 theoretical heat units. The figures may be conveniently summed up as follows:—

	Thermal Units at Light Source.		Transformed into Light.		Candles.
Electricity—					
Arc lighting	75,000	..	7,500	..	40,000
,, (actual example)	15,000	..	1,500	..	8,000
Incandescent	75,000	..	3,750	..	6,400
,, (actual example)	15,000	..	750	..	1,280
Gas—					
Regenerative lamps	378,000	..	22,680	..	3,600
Welsbach incandescent	340,000	..	40,800	..	7,200
Welsbach, with Denayrouze's burner	378,000	..	—	..	11,250
Water gas (from 100 lbs. of coal) burnt in Welsbach burner	—	..	—	..	23,328
Incandescent gas lighting under favourable conditions	150,000	..	7,500	..	14,000
Coal converted into fuel gas, and employed in gas-engine to generate electricity (actual example)	—	..	—	..	9,400

The calculations by which the author arrived at these figures are too numerous to reproduce here; but, from the above, other interesting information may be easily derived—such as the percentage of the original energy at the light source; the percentage of original energy transformed to light energy; and, dividing the candles by 16, this will show the number of 16-candle lights represented. The actual quantity of coal used in most electrical stations is several times in excess of the theoretical, as (unless accumulators are employed) sufficient power must be kept ready to supply the maximum demand for current at any moment; whereas in the manufacture of gas, this difficulty is overcome by means of a cheap form of storage in gasholders. Here Mr. Lewis showed a load card for an electrical station and a gas-works for one day; and he pointed out that experience with lighting shows the ratio of the maximum to the mean had a tendency to increase, which is not a point in favour of electricity.

Dealing next with the question of illuminating power and illuminating effect, Mr. Lewis said the illuminating effect of sources of light having equal candle powers, as ascertained by photometric observations, varies considerably—that is, the general illuminating effect of a particular burner may be more or less than another form of burner which shows an equal candle value when tested in the photometer. This is chiefly due to the following causes: The candle value of a source of light is usually tested on the horizontal plane only; whereas the candle value at angles above and below the horizontal are either more or less than the light so obtained, according to the class of burner employed. As an instance of this, he mentioned the ordinary form of regenerative lamp, the maximum candle power of which is on the vertical centre line of the lamp, and

gradually decreases until the horizontal is reached; while an argand gives the best results on the horizontal, and falls away to *nil* on the vertical line below. Diagrams exhibited by the lecturer showed the spherical candle power of a batswing (face value), regenerative, and incandescent burner, each of 16 nominal candle power; and, by succeeding diagrams, it was seen, in a very marked manner, how radiation and diffusion alter the spherical candle power. The question, he said, was still further complicated by the fact that the power of a standard candle varies from 0·414 to 1·19 candles, according to the angle at which it is tested. Therefore, to make a strictly proper comparison, the candle power of a source of light at any particular angle should be compared with that of a candle at the same angle. Thus, supposing it is found that a candle tested at an angle of 45° below the horizontal showed a value of 0·925 candle, and a source of light at the same angle an apparent candle power of 18·5, then $\frac{18{\cdot}5}{0{\cdot}925} = 20$ candles. But, as the general adoption of such extreme nicety would involve considerable labour, it may be neglected, as the difference is not great. Mr. Lewis described the construction of a photometer, and explained the laws of intensity of light. An interesting feature at this stage was a series of diagrams showing the comparative distribution of horizontal illumination from sources of light of various characters. One noteworthy point was the clear indication they supplied of the importance of reflectors, which applies most strongly to the Welsbach system. The form of reflector chosen for illustration by Mr. Lewis was the Holophane globe, which, he said, is probably the most scientifically correct and efficient in the market, as it converts an intense spot of light into, apparently, a globe full of soft, pleasant light, and also collects and throws downwards a large proportion of the light emitted at angles above the horizontal. The importance of this is evident when it is considered (as shown by Dr. Drehschmidt) that one-third of the total light given by the incandescent burner is emitted in a zone lying between the horizontal and 30° above (*ante*, p. 181). The lecturer regretted that we have no intelligent term representing the intensity of a surface; and he ventured to suggest as a standard the light of 10 candles at 10 feet, or 1 candle at 3·333 feet. Thus—

$$\frac{10}{10^2} = \frac{10}{100} = 0{\cdot}1 \text{ intensity; or}$$

$$\frac{1}{3{\cdot}333^2} = \frac{1}{10} = 0{\cdot}1 \text{ intensity.}$$

The lecture concluded with the following figures, indicating the relative cost to a consumer of lighting from several sources: Welsbach incandescent burner, 0·15; albo-carbon light, 0·3; oil-lamp, 0·3; argand gas-lamp, 0·5; incandescent electric lamp, 1·3; regenerative lamp, 0·2—including allowance for renewals of mantles and incandescent electric lamps.

Discussion having been invited,

Mr. W. J. Lineham, Professor of Engineering at the Goldsmiths' Institute, stated that he had introduced Welsbach gas-burners pretty largely into his house; and his experience was that the objections to them were many, but the advantages were such that he would not be without them. He was constantly sending out for new mantles and chimneys; and his gas bill last quarter, instead of being less, was 10s. more. He also found that the sinking of the efficiency of the light was one of the greatest defects.

Professor Carlton Lambert mentioned that he was now making some comparative tests of the Welsbach and Sunlight mantles. He had tested eight of each mantle, one after the other, taking the photometrical value on the horizontal plane. The average came out exactly 66 per cent. in favour of the Welsbach. The lights were to be run 100 hours, and tested again; and then after a further 100 hours. The falling off of the duty of incandescent lights was very much connected with the dusting of the room. If Mr. Lineham would do as he did—take down his Welsbach lamps, and blow through them, he would have a new mantle instead of an old one. His own gas bill was quite as heavy as previously; but he had the advantage of about six times more light than formerly. There was no doubt there was a falling off in the power of the Welsbach light, due to the weakening of the mantle; but it was very slight indeed. He was quite prepared to find, when he tested the Welsbach and Sunlight mantles again, that the falling off would not be more than 6 or 7 per cent.; and after 300 hours it would not be more than 20 per cent. As to the difference between illuminating power and illuminating effect, he hoped that would not be run too far. Professor Lewes, when he made a statement in regard to this, never meant half as much as people who had read his lectures thought he did. When he drew a curve, representing the intensity of a Welsbach burner 60° from the horizontal, he did not mean that the burner was to be condemned because there was no light underneath. The only thing that had to be done was to buy a paper shade—indeed, it was not fair to the Welsbach light to look upon it as complete without a shade.

Mr. C. Tanner, jun., and other gentlemen having spoken,

Mr. Lewis replied; one of the points which he particularly emphasized being the necessity of having efficient governors with Welsbach gas-burners—he having found they were not always so.

A hearty vote of thanks was passed to the lecturer.

THE DECOMPOSITION OF HYDROCARBONS BY HEAT.

The researches of Dr. F. Haber and Herr H. Oechelhaeuser described in the paper of which the following is an abstract translation, form a sequel to those carried out by Dr. F. Haber and Herr G. Samoylowicz, of which an account has already appeared in the "Journal" (*see* Vol. LXVIII., p. 458). These earlier researches are frequently alluded to in the present paper; the text of which has been published in recent numbers of the "Journal für Gasbeleuchtung."

The earlier researches referred to, did not completely solve the question of the manner in which fatty hydrocarbons are decomposed by heat. Hexane had not been studied at temperatures of 900° to 1000° C. They left it doubtful whether benzene is formed by the closing up of the six members of the hexane chain while hydrogen is split off, or whether it is built up from lower molecules, which arise by rupture of the hexane chain. If trimethylethylene is found to yield as much benzene as hexane does, then the latter theory of the formation of benzene must be adopted; but if it is found to yield less, then the former theory must be the correct one. Therefore, it became necessary for the solution of this important question that researches similar to those already made with hexane, should be made with trimethylethylene. The upshot of such researches has been that benzene has been found to result as freely from trimethylethylene as from hexane. It has again been demonstrated that hexane tends but little to detach hydrogen at incipient redness, and that rupture of the carbon bonds, with transference of hydrogen, occurs almost exclusively, and dominates the whole course of the process. The unsaturated molecular residues which result from the splitting off of the terminal radicles of trimethylethylene at 600° to 800° C., do not remain as such, but combine to more complex forms. This behaviour harmonizes with the structure of trimethylethylene.

The apparatus used in the researches is first described; then the special methods of gas analysis devised for the work; and, thirdly, the actual experiments on decomposition. An appendix deals with the thermo-electric method of measuring temperatures which was used in the researches.

I.—*The Apparatus.*

A uniformly high temperature, which may be kept absolutely constant or varied with precision, is not readily attainable by processes of combustion. Attention was, therefore, directed to the electric furnace, of which there are two typical patterns. The arc pattern has already been used by Moissan in investigating phenomena of the chemistry of gases; but it is only suitable for very high temperatures. The heating of a constant resistance, which is the principle of the other pattern, was more suited for application in these researches. This type of furnace was readily adapted to the purpose; the heated conductor was tubular, and the stream of gas was passed through it. The conductor may be either of platinum or platinum-iridium, or of carbon. The former is the better, so long as its relatively low melting point is not attained, as it does not undergo change in air. In either case, the walls of the conductor are not impermeable to gas; and for quantitative experiments, a thin-walled porcelain tube was passed through the platinum conductor. Tubes of the No. 7 size, from the Royal Berlin Porcelain Works, could be used at any temperature below that at which the platinum conductor melted. With the carbon conductor, qualitative experiments only could be made, by passing the gas under pressure through the conductor itself. Some gas then escaped through the walls of the conductor.

The platinum furnace was made by rolling a piece of sheet platinum 0·002 inch thick, 15·75 inches long, and 2·17 inches wide, into a tube. To each end of the sheet of platinum was soldered a sheet of copper 0·04 inch in thickness, of such dimensions that, when the platinum sheet with the copper ends was formed into a roll of one turn, there remained at each end copper flaps 2 inches wide and 1·575 inches deep. These flaps, dipping into mercury in iron cups, served to convey the current to the platinum tube. A porcelain or glass tube, protected externally by a thin coating of asbestos paper, was then pushed through the platinum conductor, the middle part of which was wrapped in several turns of asbestos paper. This wrapping of the middle of the platinum conductor with asbestos prevents the loss of heat from that part; and it may thus be brought to a white heat while the uncovered end portions do not even glow visibly. The furnace was inclined slightly, to permit tar to flow away; and it was supported by fire-bricks, so that it did not bend of its own weight as it became hot. The iron cups were put at the necessary heights for the copper flaps to dip into them; and they were two-thirds filled with mercury, which was then covered by a thin layer of water.

The conducting wires from the battery of accumulators were clamped to these cups. Two batteries were available—viz., one of 36 elements of 36 ampère-hours capacity, and the other of 36 elements of 160 ampère-hours. The first, coupled in groups of four cells, gave a choice of 8, 24, or 72 volts; the second, in groups of six cells, gave a choice of 12, 24, 36, or 72 volts. The conducting wires were chosen of such diameter that they caused practically no loss of potential. The resistance of the furnace at about 1000° C., was about 0·06 ohm; and therefore the small

battery at 8 volts gave a current of 120 ampères, and the large one at 12 volts 200 ampères. These currents were too powerful for producing temperatures up to about 1200° C. A resistance-piece, formed of two parallel brass tubes connected at their lower ends, was therefore used. Water under constant pressure circulated through the tubes; and the resistance was found to be 0·07 ohm. By means of a copper slide on the tubes, this resistance could be lessened by any desired amount. This resistance-piece served, when coupled with the small battery at 8 volts, to give currents of 60 to 110 ampères. With the larger battery, three such resistance-tubes were used. After the resistance-piece, an ampère meter was placed in the circuit.

The temperature in the furnace was ascertained by the thermo-electrical arrangement described in the appendix. The results of the measurements of temperature within the furnace, before the vapour was admitted, were stated in degrees Centigrade, for positions measured either way from the middle point of the furnace-tube. The vapour was always admitted at the same end (to the left hand) of the furnace; and the variations in temperature of the hottest part of the tube during the passage of the stream were noted. The vaporizing apparatus formerly used had the disadvantage of not producing the vapour at a uniform rate—a matter of little importance, so long as the tube was very narrow and tortuous. Uniform heating of the particles of gas became impossible in the straight and wide passage of the electric furnace, if there were sudden rushes of vapour; and the vaporization was therefore (on a suggestion by Dr. Bunte) carried out by the aid of a wick. A wick of soft cotton was inserted in the leg of a glass T-piece, so as to reach about half the length of the leg. The protruding end of wick dipped into the liquid to be vaporized; and the middle part of the leg of the T-piece was steam-jacketed. The upper end of the wick being thus maintained at 100° C., a continuous vaporization of the liquid took place; but to ensure a uniform rate, it was necessary that the liquid should, by some device, be maintained at a nearly constant level. The leg of the T-piece passed through a hole in a cork into the burette containing the liquid; the cork preventing evaporation of the liquid. A second hole through the cork accommodated a glass tube, connected with a rubber bag. Water was admitted at the lower end of the burette, to maintain the upper level of the liquid; and the height of its lower level was read at intervals.

A condensing flask and two worms, immersed in a mixture of salt and ice, came after the furnace, to prevent tar passing into the next five unweighed vessels. The first three of these contained an ammoniacal solution of silver nitrate for the retention of acetylene. The next two contained dilute sulphuric acid; and then followed two bubbling tubes containing paraffin oil. These four vessels were immersed in ice. After the paraffin oil, came the aspirator, arranged for measuring the volume of gas in the same manner as in the researches on hexane previously described.

(To be continued.)

PUBLIC LIGHTING BY THE WELSBACH SYSTEM IN PARIS.

M. Maréchal, the Engineer of the Municipal Service of Paris, whose interesting work on the "Lighting of Paris" has been noticed in the "JOURNAL"* has contributed to the "Génie Civil" an account of the application of the Welsbach system to the public lighting of the French capital. Considerable interest has been manifested in the installation by English gas engineers; one of whom—Mr. Colson, of Leicester—has taken it as the basis of the improvements lately effected in the lighting of that town. The great majority of the streets of Paris are lighted by ordinary batswing burners consuming 5 cubic feet of gas per hour, and producing the light of 10 decimal candles, or about 9·5 English candles. Recuperative burners are, however, employed in some of the principal streets—about 2640 being in use. With the view of improving the public lighting, officials of the municipal service have for some time been experimenting with Welsbach burners. They found that, to obtain thoroughly satisfactory illumination, it would have been necessary to at least treble the intensity of the ordinary lights, which, of course, could have been done by placing three batswing burners in one lantern. But this would have entailed an additional yearly expense of 437 frs. per burner, or a total of 6,576,000 frs. for the whole of the lanterns fitted with these burners now in use in Paris. Recourse was therefore had to incandescent gas-burners; and about 1450 of them are now at work.

The principal portions of the city illuminated by the Welsbach system are the open space in front of the Cathedral of Notre Dame, the Place de la Concorde, the Avenue des Champs Elysées, the Avenue de la Grande Armée (which is a continuation of the first-named avenue beyond the Arc de Triomphe), and the Place du Théâtre Français, at the bottom of the Avenue de l'Opéra. Speaking generally, one ordinary batswing burner has been replaced by a No. 2 Welsbach burner of the French Incandescent Gas-Light Company, which consumes only 4 cubic feet of gas per hour. The change involved an outlay of 30 frs. for each single-jet lantern, inclusive of the fittings of the burner; but considerable improvement was effected in the lighting. In carrying out the new installations, M. Maréchal applied the principles laid down in the work referred to above for ensuring equal illumination of the ground corresponding to the number of light-centres employed. This system is explained in an article which appears in another part of the "JOURNAL" to-day. Taking the Avenue de la Grande Armée first, a group of six lamps, fitted with batswing burners, in the middle causeway, had a large portion of the centre space not illuminated; whereas with Welsbach burners this defect was entirely removed, and the total amount of light was four or five times greater. Similar results were obtained in a street in which the lamps were placed in quincunx, or zigzag, order, some 27 yards apart; the substitution of Welsbach burners for the ordinary batswings increasing the lighting three times.

The question naturally arises: At what cost was this additional illumination obtained? Here comes in the point of the durability of the mantles. The trials which have been carried out have shown that the breaking of the mantles depends very largely upon the location of the lantern, the method of lighting, and the skill of the lighter; but it may be assumed that a mantle will last 68 days, which represents 5·37 mantles per annum. Days are given in preference to hours, for the reason that the special causes of deterioration of the mantle are its lighting and extinction. With this number of mantles, the economy effected in the consumption of gas suffices to compensate for breakages. The increased illumination is therefore obtained without any additional annual outlay.

The foregoing is a comparison of the Welsbach system with ordinary batswing burners. It may be of interest to see whether there is any economy in substituting it for those of the recuperative type. Taking a street in which the lamps, fitted with these burners, consuming about 26½ cubic feet of gas per hour, are placed 22 yards apart, the unit of lighting—in other words, the illumination for one hour of an area 12 yards square, all parts of which would receive the light of one candle—would come to 3·65c., as compared with 6·81c. with batswing burners, but only 2·27c. with Welsbachs. Comparing these figures with the cost of the electric arc when employed under similar conditions—viz., 1·62c.—the incandescent gas system appears to be less advantageous. But M. Maréchal says it must be borne in mind that wherever the electric light has been adopted, the yearly lighting expenses have had to be increased; whereas the Welsbach system allows of the lighting of the average streets being materially improved without any augmentation of the charges for maintenance. The incandescent gas system appears to him, therefore, to be a very economical one for the lighting of public thoroughfares. And besides, it is only reasonable to suppose that before long the capabilities of the burners will be still further improved. Some very interesting trials are now, he says, being made; and if they produce satisfactory practical results, it will be easy to have at a cheap rate, in the smaller streets of Paris, lighting which will be really worthy of the city.

* See Vol. LXIV., pp. 416, 643.

THE COMMERCIAL POSITION OF SULPHATE OF AMMONIA.

At the last Meeting of the Nottingham Section of the Society of Chemical Industry, held at the Station Hotel, Burton-on-Trent, on the 27th ult., under the presidency of Mr. F. J. R. CARULLA, a discussion took place on the above subject, which, it may be remembered, was the topic selected by the President for his address at the opening of the session last November, and noticed in the "JOURNAL" for Dec. 15 (p. 1183).

The PRESIDENT, in commencing the discussion, expressed the opinion that it would be useless to look for relief to suggestions for the better employment of ammoniacal liquor in the manufacture of some other product than sulphate. What was of importance to the sulphate industry was that the farmer should understand the value of nitrogen, as such, in a manure, no matter how it might be present. In the Fertilizers and Feeding Stuffs Act, for instance, the unit of nitrogen had the same value whether derived from nitrate of soda, sulphate of ammonia, or any other source. This action of the Government should be impressed upon the farmer.

Mr. J. O'SULLIVAN said the authorities he had consulted concurred as to the equal value of the unit of nitrogen, whether derived from nitrate of soda or from sulphate of ammonia; and he thought that, if this was correct, that farmer was the wisest who availed himself of the variations in prices, and always bought that which was nitrogen, for nitrogen was the cheapest. He would ask whether any experiments had been made, such as those of Lawes and Gilbert, to prove the equal value of the unit of nitrogen in the two manures in actual practice.

Dr. F. CLOWES referred to the enormous expenditure incurred by the Scottish ironmasters in adding ammonia absorbing plant to their blast-furnaces. He said he knew that some English blast-furnace owners had followed the example; and others were also about to put down plant for this purpose. If the use of sulphate of ammonia seemed to be decreasing, he failed to see what benefit they could expect from such expenditure.

Mr. J. WHITE said that what he felt to be a grievance was that wherever nitrate of soda supplanted sulphate of ammonia, English people were losing the benefit of a home manufacture, as all nitrate was imported from abroad. With regard to the

Fertilizers and Feeding Stuffs Act, to which reference had been made by the President, it was quite true that the unit of nitrogen had the same value, no matter whence derived. The Act was practically inoperative, owing to the manner in which the sample had to be taken. What was really wanted was the appointment of inspectors, as had been done under the Food and Drugs Act.

Mr. O'SULLIVAN said it struck him that the great obstacle to the spread of the use of sulphate of ammonia was its name. Nitrate carried the idea of nitrogen to the ordinary man's mind; whereas sulphate did not. If it could be re-christened, so that the name should convey this idea, it might prove a good thing.

The PRESIDENT, in reply, said experiments had actually been conducted over and over again in the sense indicated by Mr. O'Sullivan, with the result that the unit of nitrogen was found to be of equal value in the two manures, or practically so. Of course, failures might occur with sulphate if ignorantly used, and brought into contact with lime. He would have a caution printed on every page of all sulphate literature to prevent the occurrence of this. With regard to the question of English ironmasters having followed the Scottish ones, it should be remembered that in Scotland almost all the furnaces were worked with raw coal; whereas the English practice was generally to use coke. In this case, the ammonia could only be recovered from the coke-ovens. The English firms who were putting down recovery plant doubtless would also use raw coal; and they might have made their arrangements before the present depression, or hoping for improvement in the near future.

Dr. CLOWES thought it was desirable to point out that the reference to lime made by the President was to caustic lime, as all soils contained lime in combination.

The PRESIDENT said this was so. It was only in the case of bringing lime in an uncombined form, or merely hydrated, into contact with sulphate of ammonia, that loss of ammonia occurred.

REGISTER OF PATENTS.

Air Carburetting Apparatus.—Devis, A., of Charleroi, Belgium. No. 858; Jan. 13, 1896.

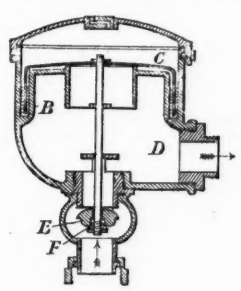
This carburetting apparatus consists of an atomizer, in combination with two bells plunging into water-tanks. One bell is raised after each descent by means of a hydraulic motor, whereby air is sucked in by a valve provided at the upper part of the bell, and forced through the atomizer in an intermittent manner. The other bell, on the contrary, is intended for maintaining a uniform pressure in the gas-pipes, and for receiving at each stroke a sufficient provision of air to feed the pipes during the raising of the first bell. Consequently, the pressure with which the air is forced into the atomizer is entirely independent of the pressure existing in the gas-pipes, and is calculated to produce the atomization of the liquid.

Cooling the Working Cylinders of Gas-Engines.—Lane, H., of Birmingham. No. 2290; Jan. 31, 1896.

This invention consists in methods of construction by which air can be used instead of water for cooling the cylinders of gas-engines. Instead of the water-space ordinarily used round the cylinder, the patentee provides a light metallic or other case, perforated in such a way that air entering from the external atmosphere efficiently strikes and cools the hot cylinder. The surface of the cylinder on which the air acts is increased by constructing ribs, webs, or vanes of comparative thinness on its surface; or the space between the cylinder and the outer case is filled with shavings or scraps of thin metal, in such a way that they conduct heat from the cylinder to the air passing over their surfaces. In order to ensure a sufficient weight of air passing between the cylinder and its case, the induced draught derived from the exhaust of the engine is employed; and, by suitably forming the case and adjusting the nozzle of the exhaust-pipe, large volumes of air are in this way drawn by inductive action through the case, and considerable cooling effect is obtained. The ejected hot air may be delivered into a suitable chamber, so as to deaden the noise of the exhaust, instead of being delivered directly into the atmosphere.

Gas-Regulator.—Amick, M. J., of New York. No. 3422; Feb. 14, 1896.

This regulator consists of a double valve—the main-valve having lateral movement upon its stem, and adapted to be seated against the wall of the inlet opening of the regulator; the second valve seating itself against the main valve, to prevent the passage of gas through the main valve, since the latter will, of necessity, be more or less loosely mounted on its stem.



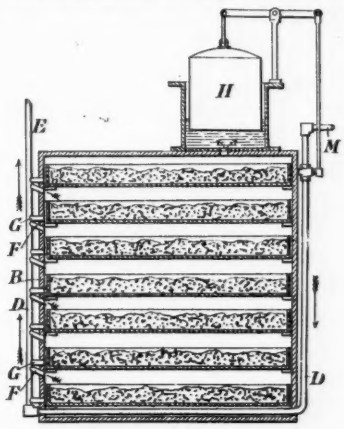
The regulator is provided with an outlet at one side, for attachment to the house pipe; while the inlet is preferably in the central portion of the bottom. A dome B is formed within the upper portion of the casing, so as to provide an annular space for mercury; the dome being provided with an opening at the top, surrounded by a downwardly extending collar. A space is left between the dome and the top of the casing; and a float C extends over the top of the dome and down into the mercury, so as to practically close the central opening. The float is attached to the upper end of a valve-stem which extends down through a guide, and also through a cross-bar supported by lugs above the top of the inlet aperture. It has a valve E loosely mounted on its lower end, having a convex upper face, and provided with a recess on its under side. A second or auxiliary valve F is secured on the extreme end of the valve-stem. It is likewise convex on its upper face, and is adapted to be seated in the recess of the main valve. The regulator may thus be placed considerably out of plumb; and when the pressure of air in the main chamber D is sufficient to raise the float high enough to carry the main valve to its seat, it will accommodate itself to the seat, and effect a perfect closure of the inlet opening. Air is admitted into the mercury chamber through an interrupted or zig-zag channel made in the top of the casing; the outer and inner ends of the channel being out of parallelism and vertically disposed, and the body of the channel connecting the ends being ordinarily horizontal. With this construction of opening, the float cannot be tampered with; and when the regulator is to be stood upon its top, all that is necessary is for the outer end of the opening to be stopped up so that the mercury cannot escape.

Gas-Engines.—Rowbotham, W., of Birmingham. No. 4184; Feb. 25, 1896.

The chief object of this invention in relation to gas-engines is said to be to subject the explosive mixture to the action of a silent electric discharge, preferably while the mixture is under compression in the cylinder or combustion chamber. By reason of this silent electric discharge, "the explosive force of the explosive mixture is increased, the ignition thereof is facilitated, and its combustion is rendered more perfect." A further feature of the invention consists in providing the space or combustion chamber wherein the explosive mixture is ignited, and also the inner end of the piston, with a lining of insulating or refractory material—such as asbestos or indestructible porcelain—by which it is possible "to retain and confine within the said space or chamber a large proportion of the heat resulting from combustion, which heat was heretofore wasted or absorbed by water contained in a jacket surrounding the working cylinder."

Generating Acetylene.—Blakeley, J. F., of Ravensthorpe. No. 5150; May 7, 1896.

As shown in the engraving, this apparatus for the manufacture of acetylene consists of a series of superimposed trays for receiving the carbide within a suitable chamber. For generating the gas, water is admitted to the carbide by means of a pipe D, which enters preferably



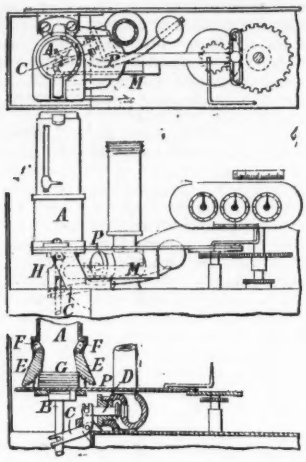
at the bottom, and gradually fills the generator. As the water rises, it comes in contact with the carbide within the series of trays, by means of suitable pipe connections attached to each tier of trays. When all the gas has been evolved from the carbide in the bottom tray, the water passes, by means of outlet and inlet pipe connections F G, to the tray next above; and this is repeated until the generator is full of water. As the gas is generated, it passes by the pipe E to a storage holder. When this is full, the pressure of gas within the governor H fixed upon the top of the generator is increased, raising same, and operates upon the valve L upon the water-inlet pipe M—gradually diminishing the water supply, and consequently the generation of the gas.

Coin-Freed Meters.—Simmance, J. F., of Hammersmith, W. No. 9216; May 1, 1896.

This invention relates to the coin-freed meters described in patent No. 1325 of 1895; the objects aimed at being to adapt the apparatus to meters in which the gas-valve controlled by it cannot be conveniently arranged under the coin-tube, and also to render more certain the retention of the gas-valve in an open condition while there is a coin in the tube, whether that coin be depressed or not by the plunger.

The illustration [next page] shows a plan, an elevation, and a section of the arrangement proposed, applied in conjunction with the reciprocating plate by which the coins are moved.

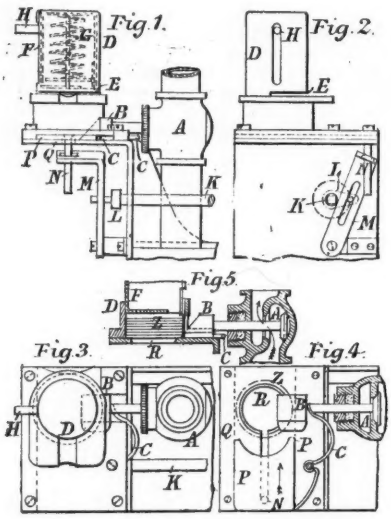
When the valve cannot be conveniently arranged immediately under the coin-tube (as is generally the case in a wet gas-meter), there is arranged under the coin-tube A a sliding rod B, to which is jointed one arm of a loaded or spring-urged bell-crank lever C, the other arm of which is jointed to a valve-stem D, so that the depression of the sliding rod by the coin causes the valve to open; and when the rod is no longer depressed, the weight or spring closes the valve. In order to retain the valve open, even when the coin in the tube is not depressed by the plunger, according to one arrangement a pair of pawls E is proposed, mounted in the tube, but differing from those described in the specification above referred to in



being pivoted on centres within the tube; these centres being themselves on spring-urged radius arms F, which are pushed aside by the downward passage of a coin. The pawls thus mounted may be of considerable length and width; their faces being cut in steps so as to catch over one, two, or a number of superposed coins G.

Coin-Freed Fluid-Meters.—Simmance, J. F., of Hammersmith, W. No. 11,202; May 22, 1896.

Details of construction of this coin-freed meter are shown in the engravings—fig. 1 being a front and fig. 2 a side elevation. Fig. 3 is a plan. Fig. 4 is a plan (partly sectional) of fig. 1. Fig. 5 is a part vertical section of fig. 3.



A is a stop-valve in the passage by which gas enters or leaves the meter. The stem of the valve has a head B, with an inclined face; the head being urged by a spring C in a direction to close the valve. The head passes through a lateral match at the bottom of a cylinder D, having at its side a horizontal slot E, by which a coin can be introduced under the hollow plunger F, which is kept up by a spring G, but which can be pushed down by hand applied to a pin H, projecting through a vertical slot of the cylinder. K is a spindle which is caused to revolve by suitable gearing connecting it to the counting gear of the meter; the connecting gear being so proportioned that, during one revolution of the spindle, the meter delivers a quantity of fluid of the value of one of the coins introduced. A crank L fixed on the spindle is engaged in the slot of a rocking arm M, the upper end of which has a hole engaging a pin N projecting down from a plate P. This plate is fitted to slide between guides on a table Q, and is hollowed out in front to partly fit the circumference of the introduced coin. The spring C is so shaped and pivoted, that it is only when the plate P is in its rear position (fig. 4) that the spring exerts its full force on the head to close the valve; the rear end of the spring then bearing against the edge of the plate P. Through the table Q, concentrically under the cylinder D, there is a hole R, through which a coin smaller than that with which the apparatus is arranged to be worked can pass.

The operator introduces a coin through the slot E into the cylinder D, and pushes down the plunger F. The edge of the coin, as it is forced down, acts on the inclined face of the head B, and pushes it aside in opposition to the spring C; thus opening the valve A. The gas then gives motion to the meter and its counter gear, which causes the spindle K to revolve, the arm M to oscillate, and the plate P to move to and fro on the table Q. As the plate P advances in the direction of the arrow, it releases the spring C; and its inclined edge, meeting the edge of the head B, pushes the head a little farther back, so as to relieve its pressure against the edge of the coin Z. The plate P, still advancing, pushes the coin onwards until it drops over the end of the table Q into a receptacle arranged to receive it. The plate P now returns until it escapes the head B, which is then urged forward by the spring C closing the valve A, and so stopping the meter. When several coins have been introduced (as indicated at Z in fig. 5), the lowest is dealt with as above described; and as the plate P moves back, the next of the coins drops to the position which had been occupied by the lowest—holding the head B back and the valve A open. This continues until all the coins are disposed of. When a coin smaller than that for which the apparatus is designed is introduced, either alone or with others, it merely drops through the hole R into a shoot arranged for receiving such coins.

Lighting Gas-Burners.—Drueding, L. H. A., of New Orleans, U.S.A. No. 19,167; Aug. 31, 1896.

This invention is especially applicable to burners of the incandescent type; the object being to provide means whereby the gas may be ignited at the tip of the burner in such a manner that the explosion of gas in the mantle is obviated, and the danger of breakage is avoided. The valve-casing of the gas-fixture is made with the usual main passage, and also with a smaller side passage, into the outer end of which passage is fitted the end of a small tube, long enough to reach to the tip of the burner, and provided throughout its length with a series of perforations, through which a small quantity of gas may escape. A little gas is first admitted to this perforated tube through the side passages, and ignited; and the flame is communicated from the lower perforation upward to the top near the tip of the burner. The gas is then turned on to the burner through the main passage, and ignited by the flame at the end of the perforated tube.

Purifying Gases or Vapours, and Gaining Bye-Products therefrom, and Subjecting Gases or Vapours to the Action of Solid or Liquid Substances, and the Converse, by Means of Centrifugal Action.—Theisen, E., of Baden-Baden, Germany. No. 23,595; Oct. 23, 1896.

In patent No. 16,726 of 1892 is described a method whereby a thin layer of liquid maintained by centrifugal action upon the surface of a revolving cylinder, was subjected to the action of gases or vapours made to impinge thereon by centrifugal action. According to the present invention, the patentee applies this method of operating in variously modified ways—either for the separation from gases or vapours of certain of their impurities, or for causing the gases or vapours to react upon a thin layer of either liquid or solid matter (or the converse), for the purpose of modifying the nature of one or other body.

Thus, according to one application, a gas containing various condensable constituents is caused to be brought by centrifugal action successively into contact with different surfaces having different actions thereon, in order to subject it to successive stages of purification, as will be hereafter described with reference to the purification of coal gas. According to another application, the combustion gases of furnaces are treated by the same method. By a third application, gases having a certain chemical constitution may, by the centrifugal action, be made to impinge upon a substance spread by centrifugal action in a thin layer over the surface of a rapidly revolving drum; and in being thus brought into intimate contact with the substance, may either be made to undergo a chemical change or it may vaporize and take up certain constituents from such material. In particular, however, the invention is applicable for carrying out the various processes of purification to which coal gas and the gases from coke-ovens are subjected, whereby valuable bye-products are obtained therefrom.

The existing modes of purification of such gases from constituents—such as tar, sulphuretted hydrogen, ammonia, &c.—are (the patentee points out) very complicated; and the apparatus required for separating the various constituents is "very cumbrous, and has only a low degree of efficiency as compared with its size and cost." By means of the present invention, it is rendered possible to effect the separation of all the bye-products and the tar in a single apparatus of comparatively small dimensions; while the several constituents are still obtained separately from each other. The apparatus is so arranged that, in the first instance, the centrifugal action to which the gas is subjected effects the separation of the solid constituents and the tar, by being thrown on to the surface of the revolving drum, to which they adhere. The hot gases in then being made to pass (under the pressure of centrifugal action) over the surface of this thin layer of tar, effect a rapid evaporation of the water contained therein—thus concentrating the latter. By then bringing the gas in contact with a portion of the drum which is cooled externally, the watery vapour, as well as the ammonia compounds contained therein, are condensed therefrom; and, in consequence of the cooling of condensed liquids thus obtained, these are rendered capable of taking up further quantities of ammonia. If the gas is to be subject to further purification, and the carbonic acid gases to be taken up therefrom, this can also be effected by bringing the gas by centrifugal action into intimate contact with a layer of material upon the surface of a rapidly revolving drum, which will take up the carbonic acid and other impurities therefrom.

Fig. 1 shows a vertical section of an apparatus consisting of a closed stationary cylindrical casing, the upper part of which is jacketed, and has cooling fluid circulated through it, entering through the upper branch-pipe M, and flowing off through the bottom one N. The lower part L of the casing is not cooled, and may be surrounded by a bad conductor of heat. Centrally within this casing is a revolving drum B, having vanes C extending along its entire length, and the shaft of which passes through a stuffing-box in the cover of the casing, and carries an external pulley, by which rapid rotary motion is imparted to it. The gases to be acted upon enter the casing through the inlet D at the bottom, where they are at once thrown by the vanes with centrifugal force against the surface of the part L of the casing, whereby, in the first instance, the particles of tar carried by the gases, together with any solid particles, will be separated from the gas and deposited on the surface, and be retained by the layer of tar formed. Thus, it is said, the gas "will be much more rapidly and effectually freed from all solid impurities and tar than is the case, for example, in gas-works; and this in apparatus occupying a comparatively small space." At the same time, the hot gases rising in intimate contact with the layer of tar, will effect a rapid evaporation of the water contained therein, which evaporation, on the other hand, will effect a cooling of the gases. The tar flowing down the surface L on to the bottom of the chamber is led off through the pipe W. The still warm and partly purified gases, in rising from the lower part of the casing, will be pressed by the centrifugal action of the vanes against the cooled surface of the upper part of the casing; and, in consequence, condensation of the aqueous vapour contained in the

gases will be effected, whereby at the same time the ammonia compounds contained in the gas, and any residual particles of tar, will also be retained by this water of condensation. By this action, also, the gas will be suitably cooled. The condensed ammoniacal liquor obtained flows down the surface of the casing, at the bottom of which it is caught up by the trough F, and led off through the pipe H, either to be treated elsewhere or to be reintroduced at the upper end of the casing, in order, in flowing down again, to be further enriched by more ammonia absorbed from the gas, which eventually flows off through the opening E at the top, to be further treated elsewhere if necessary.

Fig. 2 shows a longitudinal section of a combination of two appliances—one of which has a vertical fixed casing, while the other is arranged horizontally, and has a revolving casing. In the first-named apparatus, the casing has a jacket, through which cooling liquid is circulated, entering through the inlet M, and discharged through the outlet N, in a similar manner to the first-described arrangement. In this casing is a rotating conical drum B, having vanes C, and carried by a shaft G, driven by a pulley. The gas to be purified enters the casing at D, and is pressed by the centrifugal action of the vanes against the surface of the casing, thereby depositing the particles of tar and solid impurities; while at the same time the aqueous and ammoniacal vapours contained in the gas will be condensed. The gas will also be cooled, and will then pass through the discharge-pipe E into the second apparatus. The condensed liquor and tar flowing down the surface is caught by the annular gutter F, and is either led away through the pipe H or may be made to pass through the passages I into a central cup K, whence it flows on to the inner surface of the conical drum B, which causes it to rise by centrifugal action, and throws it at the upper end on to the surface of the casing again, in order to be enriched by taking up further ammonia.

The second (horizontal) apparatus consists of a closed cylinder O, which runs with necks P on supporting rollers, driven so as to effect its rotation. The cylinder contains a drum Q with vanes R, the shaft of which is carried in external bearings, and receives rapid rotary motion in the contrary direction to the cylinder through suitable gearing—such as pitch wheels and chain. The pipe E connecting the first apparatus with the second one fits with a stuffing-box through the one end of O, while the discharge-pipe U fits with a stuffing-box through the other end. Into the interior of O is fed a supply of suitable liquid or semi-liquid material that will act in an absorbent or purifying manner upon the gas entering through E from the first apparatus, which material is maintained by the centrifugal action in a thin layer upon the surface of the cylinder. The entering gas is thrown by the centrifugal action of the vanes R against the layer of material; and in flowing in intimate contact with the latter, it will be effectually acted upon thereby, for the absorption of carbonic acid or other impurities therefrom. The absorbent material—such as milk of lime—is introduced into one end of the cylinder through the fixed pipe S; and after flowing along it, passes at the other end into the circular gutter V, whence it is taken by a scoop pipe T, in order either to be introduced into the other end of the cylinder again or be led away to wherever required. The gas, after having been thus freed from carbonic acid and other impurities, flows off through the pipe U. If the absorbent liquid is to be continuously fed back into the cylinder, the pipe T may deliver it into a tank, whence it is drawn by a force-pump which forces it through the pipe S, as indicated.

Fig. 3 shows a longitudinal and a cross section of a modified arrangement of the second apparatus, in which a pulverulent absorbing material—such as dry slaked lime—is employed, instead of a liquid one. For this purpose, the revolving cylinder O may be of perforated metal or wire gauze, and is surrounded by a stationary closed casing X, through stuffing-boxes on the ends of which the necks P of the cylinder O pass. The central fan Q is formed tubular, for receiving the gases from the pipe E, and has a number of tubular radial arms, between which are fixed the fan-blades R. Thus the gases entering through E are thrown by centrifugal action against the layer of pulverulent material, maintained by centrifugal action upon the inner surface of the perforated cylinder O; and they consequently pass through such material, and through the perforated cylinder, into the annular space surrounding the latter. By this means, the gases are brought into intimate contact with the absorbent material, whereby the latter will be made to effectually take up the impurities of the former; the purified gases then passing off from the casing X through the branch-pipe U. The absorbent material is introduced into the cylinder through the pipe S at one end, and is acted upon by a series of scrapers carried by a shaft, so as to be stirred up and gradually fed forward; while at the same time it gradually falls through the perforations of the cylinder into the surrounding casing, where it is caught up by a conveying worm C, which either carries it away to be regenerated or otherwise treated, or it feeds it back to the pipe S to be again passed through the apparatus.

The arrangement shown at fig. 4 consists of three appliances, disposed in a row, and communicating with each other, so that the gas passes consecutively through each of the apparatus. The first apparatus consists of a closed non-jacketed cylinder, mounted with necks on driving-rollers, and containing a fan drum C with vanes D, mounted on a shaft passing through stuffing-boxes and carried in external bearings. The gases to be treated enter the cylinder through a pipe E fitting with a stuffing-box through the end plate thereof. It is thrown by the centrifugal action of the vanes D against the cylinder, whereby the solid impurities are separated from the gas and adhere to the cylinder surface. At the same time the hot gases, in being made to flow intimately in contact with the layer of tar by the centrifugal action of the vanes, will produce an effectual evaporation of the watery constituents therefrom; thereby concentrating the tar, and also cooling the gases by the evaporation. The tar, &c., as it accumulates on the cylinder, flows along the same to the annular trough F, whence it is taken by a stationary scoop-pipe G, which conveys it away; while the partially cooled gas, purified from tar and solid matter, passes through the pipe H into the second apparatus, where it has its temperature further reduced. For this purpose, the cylinder is in this case provided with a jacket in which cooling liquid is made to circulate; entering through the stationary pipe I, and revolving central pipe X, having a branch-pipe K communicating with one end of the jacket, while the other end of the latter communicates by a pipe L with a stationary pipe M, through which the circulating liquid flows off. The cylinder contains a fan-drum C with vanes D, which presses the entering gas by centrifugal action against the cooled cylinder, whereby the remaining moisture is condensed therefrom, as are also the ammoniacal constituents contained therein; while at the same time the gases are further cooled. The condensed ammoniacal liquor is collected in the annular trough F, from which it is removed by the stationary scoop-pipe N, while the purified gas passes through the pipe Z into the third apparatus, which is of the same construction and action as the horizontal apparatus in fig. 2, and serves the same purpose—viz., to absorb the carbonic acid or other gaseous impurity from the gas by means of an absorbent body (such as milk of lime) supplied to the interior of the cylinder O by the pipe S.

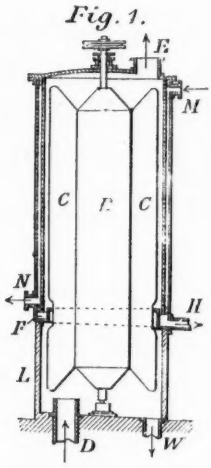


Fig. 1.

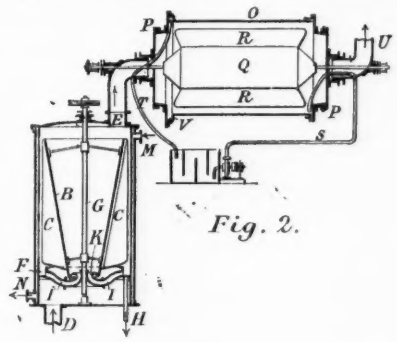


Fig. 2.

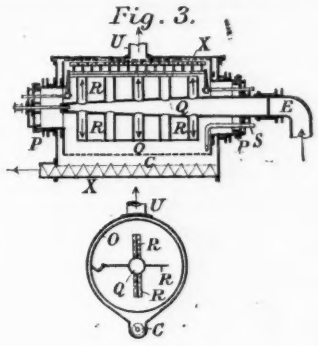


Fig. 3.

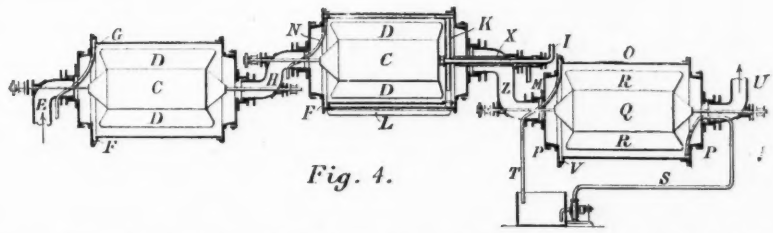


Fig. 4.

Production and Combustion of Acetylene Gas.—Turr, R., of Paris. No. 24,274; Oct. 30, 1896.

This invention relates to the production (with or without the combustion) of acetylene gas in apparatus characterized by the combination of two concentric vessels—the inner one closed, the exterior one open—filled with water to a determined constant height, with a hopper or cage for carbide of calcium provided with a basket at its base, through the meshes of which the residue falls. In combination with this is a toluol or petroleum layer floating upon the water, with a regulator of the supply of water which will determine, by the excess of the pressure itself, a temporary stopping of the production of the acetylene.

Rotary Gas-Engines.—Gathmann, L., of Chicago, U.S.A. No. 24,550; Nov. 3, 1896.

This invention relates to engines of the class employing an explosive charge as the source of power and propelling medium, as distinguished from engines wherein compressed air, steam, and analogous gases are employed as the propelling medium—namely, such gases exerting power by expansion due to the release of pressure thereon. The object of the invention is to make an engine operated by a continuous series of explosions, so as to provide, in a small compass, an effective and powerful engine. To attain this result, the cylinder, with a revoluble piston, is placed between the chamber or channel wherein the explosive force of the gas exerts itself. The piston is supported by a shaft mounted in bearings outside the cylinder, and does not come in contact with it. The piston is

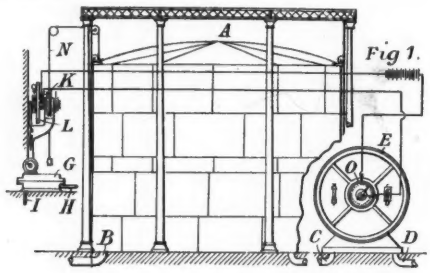
set within the cylinder, and fits therein with a small space intervening between the relatively moveable parts—to avoid friction; while the bearings for the piston-shaft are arranged in curved side arms. The curvature of the arms provides for sufficient elasticity, to compensate for the expansion of the working parts of the engine caused by the variations in temperature therein. Provision is made for the cleansing of the chamber between the cylinder and piston after each explosion, so as to remove all spent and inert gases entirely before a new explosive charge is admitted. Thus, in each explosion, the full force of the explosive medium is obtained.

Acetylene Gas-Lighting Apparatus.—Gillet, S. D., Forest, G., and Bocandé, J. E. O., of Paris. No. 27,085; Nov. 28, 1896. Date claimed under International Convention, May 30, 1896.

This apparatus for lighting by acetylene gas comprises a generator enclosing a vessel containing the carbide of calcium above which the water, after having traversed a filter, is caused to fall drop by drop from nozzles on the carbide. The gas thus produced is conveyed by a conduit into a reservoir first filled with water, where it accumulates and drives the water into another higher reservoir by the intermediary of a plunger tube; so that the gas in substituting itself for the water in the reservoir causes the height of the water above the outlet to decrease, so that the flow of the water diminishes also, in order to regulate automatically the production of gas.

Indicators for Gas-Apparatus.—Boult, A. J.; a communication from the United Gas Improvement Company, of Philadelphia, U.S.A. No. 27,271; Dec. 1, 1896.

As explanatory of the object of the patentees, they point out that "frequently the volume of illuminating gas generated during equal periods is not the same; and, in many instances, the generation of gas is intermittent. For convenience, the gas is delivered, as generated, into a relief holder; and is withdrawn therefrom at a substantially uniform rate, through a station meter. Under these circumstances, and in order to ascertain the quantity of gas generated during any given period, it is necessary to refer not only to the station meter, but also to the relative position or height of the relief holder; and this operation is troublesome, requires time and care, and involves some calculation. In practice, many illuminating gases are enriched by the addition of oil; and it is, of course, desirable that a constant quantity of oil should be introduced for each unit of volume of gas, in order that the quality of the gas may be uniform and waste of oil obviated." The principal objects of the invention are: First, to provide an indicator which may be located conveniently for the attendant in charge, and which will indicate at a glance the volume of gas generated during any period; and, second, to combine with such indicator means of showing whether or not the desired quantity of oil is added per unit of volume of gas generated.



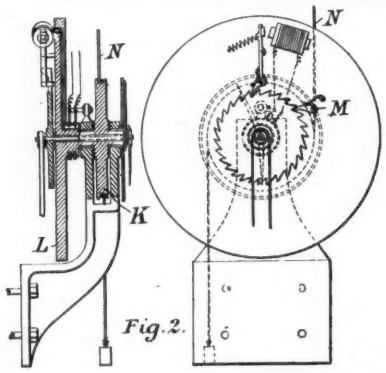


Fig. 1 is a diagrammatic view illustrating features of the invention and showing a relief holder, a gas-meter, an oil-meter, an indicator, and mechanism for connecting these parts. Fig. 2 shows central sectional and rear elevational views of the indicator illustrated in fig. 1.

The relief holder A, into which gas as made passes by way of a pipe or conduit B from a generator, is so arranged that the gas can be constantly drawn or pumped by way of the conduits C D through the gas-meter E. G is an oil-meter, through which the oil used for enriching may pass, by way of the pipes H and I, and which is provided with a pointer to indicate the quantity of oil passing. There is a differential indicator, preferably located at some point convenient to the attendant in charge. It comprises a fixed dial, a gas-hand, and a support or bracket. The pulley K is formed integral with, or connected to, a revoluble sleeve and disc. Within the sleeve is mounted, so as to turn therein, a spindle, to one end of which the gas-hand is secured, and to the other end a ratchet-wheel, so that the parts constitute, in effect, one piece. The disc L carries a pawl for driving the ratchet-wheel; and it may also carry a detent M for preventing the retrograde movement of the ratchet-wheel. Motion is transmitted to the pulley K from the relief holder by a band, belt, or equivalent device N; and the advancing motion of the pointer of the gas-meter is imparted to the ratchet-wheel. In the embodiment of this invention shown in the drawings, electricity is availed of for this purpose. When the pointer makes a revolution, it completes the electric circuit by way of the insulated contact O, so that the gas-hand is advanced in respect to the dial.

The various parts are designed in such manner that, as the station-meter index advances and the relief holder falls—for example, when the gas is being withdrawn by way of the conduit D, and no gas is being generated for admission by way of the conduit B—the relief holder will operate by way of the connection N and its connected parts, to move the gas-hand backward as much as the station-meter index tends to advance it by reason of the described connections from the index to the spindle. The net result of this differential action will be that the gas-hand will stand still (except for slight vibration) as long as no gas is being passed into the relief holder. When, however, gas is put into the relief holder, the net effect of the two motions imparted to the gas-hand by the rise and fall of the relief holder and the advance of the index of the gas-meter, is to show the amount of gas made during any period. If the gas generated into the relief holder equals the amount pumped from it, the relief holder will stand still, and the gas-hand of the indicator will correspond with the gas-meter index or pointer. If more gas is pumped out of the relief holder than is supplied to it, the relief holder will fall, and will turn the indicator hand backward from the position which it would occupy if operated only by the station meter. If less gas is pumped out of the relief holder than is supplied to it, the relief holder will rise, and thus turn the indicator hand forward farther than it would be turned by the station gas-meter. The described motions are imparted to the hand more or less simultaneously, so that its position at the time of observation depends upon their net result.

APPLICATIONS FOR LETTERS PATENT.

2574.—Akroyd, J. & B., "Acetylene gas generator." Feb. 1.
2591.—Williamson, R., "Conveyors." Feb. 1.
2657.—Biheller, S., "Gas-lanterns." A communication from the Actien Gessellschaft vorm. C. H. Stobwasser and Co. Feb. 1.
2679.—Simpson, W. E., "Internal combustion engines." Feb. 2.
2738.—Watson, P. B., "Producing atmospheric gas from liquid hydrocarbons." Feb. 2.
2739.—Watson, P. B., "A regenerating argand or bunsen burner." Feb. 2.
2752.—Heymann, E. & F. W., "Gas-burners." Feb. 2.
2754.—Moon, P., and Paston, T., "Device for removing mantles from incandescent gas-lamps." Feb. 2.
2756.—Javal, E. A., and Cargill, G., "Production of acetylene gas." Feb. 2.
2766.—Thompson, W. P., "Gas apparatus." A communication from G. F. Ransom and L. D. Dorschel. Feb. 2.
2773.—Loscher, A., "Gas-burners." Feb. 2.
2790.—Bresson, L., and Pacotte, P., "Electric furnaces for use in the manufacture of calcium carbide." Feb. 2.
2855.—Woods, I. W., "Fluid pressure regulator." Feb. 3.
2889.—Lea, J. W., and Perrins, J. H., "Gas globe or shade holders." Feb. 3.
2894.—Maxim, H., "Apparatus for the production of calcium carbide." Feb. 3.
2901.—Linke, R., "Protecting device for use with lamp chimneys for incandescent burners and the like." Feb. 3.
2931.—Brooke, R. G., "Purifying fluids." Feb. 3.
2945.—Thorburn, T., "Generator for the manufacture of acetylene gas." Feb. 4.
2956.—Clayton, R., and Ward, T., "Gas cooking-stoves." Feb. 4.
2958.—Nixon, G., "Loading coal and coke." Feb. 4.
2976.—Dennis, W. H., "Acetylene gas lamps and generators." Feb. 4.
2983.—Reed, F. J. P., Spearman, W. T., and Wright, W., "Incandescent gas-burners." Feb. 4.
2984.—Walker, H., "Production and purification of acetylene gas." Feb. 4.
2997.—Lazzar, E., "Chimney for lighting purposes." Feb. 4.
2999.—Xanthippe, Ltd., and Morris, J. C., "Incandescent gas shade." Feb. 4.
3013.—Thompson, W. P., "Production of acetylene gas." A communication from P. P. H. Macé and L. L. H. Gérard. Feb. 4.
3025.—Maxim, H., "Cooling devices for gas-engines." Feb. 4.
3060.—Fenby, J. B., "Producing acetylene." Feb. 5.
3098.—Machuca y Llorca, J. de V., "Gas-engines." Feb. 5.
3100.—Wilton, G., "Explosion engines." Feb. 5.
3213.—Gregson, J., and Jeans, A. G., "Burners for use with incandescent mantles." Feb. 6.
3219.—Zschocke, G., "Hurdles or grids for gas purifiers." Feb. 6.

New Reservoirs for the East London Water Company.—The Engineer of the East London Water Company (Mr. W. B. Bryan, M.Inst.C.E.) has deposited, for the information of Parliament, an estimate of £342,000 as the expenditure of capital required by the Company in order to construct the necessary storage reservoirs which are proposed by their Bill of the present session, "to enable the Company to supply the water necessarily required by the increased and increasing population of their district." The new reservoirs will cover an area of 92 acres on Chingford Marsh, Wild Marsh, and Mitchley Marsh. It is proposed to meet this expenditure by the creation of debenture stock.

A Question as to a Right of Way at Cheltenham.—A claim was recently made against the Cheltenham Gas Company by Mr. Joseph Middlemiss, for damages for having been deprived of a right of way over an occupation road which the Company have purchased and closed. The claimant is a market gardener, and succeeded his father as owner of Moors Garden, adjacent to the gas-works. Along one side of these gardens ran the road in question, a right of way over which claimant's father acquired when purchasing the gardens, though the soil remained in the ownership of a Mr. Wilson. The Company bought this road from Mr. Wilson, and are constructing a railway on the site. For the Gas Company, the right was valued at £50. The Arbitrator (Mr. O. J. Williams, the Registrar of the County Court) has now awarded claimant £100, which decision will carry costs.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Carburetted Water Gas and Carbon Monoxide.

SIR,—When, in your last issue, we reproached the local newspaper responsible for the recent "agitation" at Garston, for suppressing contemporary instances of deaths by coal gas—as at Cork and Drogheda—we were slandering editorial enterprise. For not only had a terrifying description of the Drogheda fatalities been published, and the absence of the culpable negligence displayed at Garston especially demonstrated; but, *by locating the casualties in Belfast*, the Editor advanced the shocking result as conclusive practical evidence of the peculiarly dangerous qualities of *carburetted water gas!*

Westminster Chambers, S.W., Feb. 15, 1897. HUMPHREYS AND GLASGOW.

Suggested Change in the Name of Sulphate of Ammonia.

SIR,—The numerous reports of meetings of societies that have appeared in technical journals, calling attention to the anomalous position of sulphate of ammonia in regard to nitrate of soda, all tend to show how slow relief is in coming to the manufacturer. No report is more interesting than that given in your issues for Dec. 1 and 8, 1896, of Mr. Ritson's paper and the discussion which followed at the meeting of the Manchester District Institution of Gas Engineers. At such discussions, expression is given to ideas which, though not bearing immediate fruit, may yet eventually lead to important results. An idea of this character I regard to be that of Mr. J. O'Sullivan, to which expression was given at the meeting of the Nottingham Section of the Society of Chemical Industry recently held at Burton-on-Trent, who said "it struck him that the great obstacle to the spread of the use of sulphate of ammonia was its name. Nitrate carried the idea of nitrogen to the ordinary man's mind, whereas sulphate did not. If it could be re-christened, so that the name should convey this idea, it might be a good thing."* When presiding at the meeting, I joined in the smile evoked by the suggestion. But, on thinking the matter over, I was struck with its great force; so that, though received in jest, it soon became to me a true word. In accordance with this idea, I would propose that sulphate of ammonia should, for agricultural purposes, be known as "Nitrogenous Sulphate," which it is; and the farmer will not be able to say that he is in any way imposed upon, for a substance that contains upwards of 25 per cent. more nitrogen than nitrate of soda, and which is besides the richest nitrogenous manure available, is surely entitled to be so called.

When one considers how successful the application of suggestive names has been in many departments of industry and of commerce, it must be admitted that the neglect of sulphate of ammonia, with its nearly 21¼ per cent. of nitrogen, for nitrate of soda, which barely contains 16½ per cent., may be due to prejudice, that only a change of name can remove. The Fertilizers and Feeding Stuffs Act makes no difference in value between the unit of nitrogen present in sulphate of ammonia and that in nitrate of soda. This fact might clearly be used with power by all those who are interested in sulphate, to convince the farmer of the magnitude of his loss. Were the loss only his own, we might keep silence; but as the whole community participate in it, not only by the enormous sums that are sent abroad for an inferior article when a better one is produced at home, but also by gas being made dearer, by tending to create depression in the iron trade, and by causing injury to the great Scottish oil industry, the case is one that calls for combined and vigorous action.

In this spirit, I trust you will kindly render your help to this national cause; hoping that the publication of this letter may induce gas authorities, ironmasters, and chemical manufacturers interested in sulphate of ammonia to adopt the name "Nitrogenous Sulphate," which must increase its sale among home farmers, and thus gradually rectify the anomaly of sending most of our sulphate abroad, and bringing nitrate from South America to take its place.

Derby, Feb. 9, 1897. F. J. R. CARULLA.

Choked Ascension-Pipes.

SIR,—With reference to the above subject, I may say that 14-inch instead of 9-inch front walls round the mouthpieces have remedied the defect. I find it is not the heat of the gas conveyed to the ascension-pipes, but the heat of the mouthpieces that is communicated to them, that sets the tar. Lower heats will remedy the defect, but at the cost of the quantity of gas produced per ton of coal carbonized. There is nothing gained by having taper pipes, only less weight of iron, as it enables one to use 5-inch H-pipes. This may effect a saving of about 5s. per retort, which is not worth considering. About four years ago, we rebuilt our retort-beds, adopting 6-inch pipes between the hydraulic main and the mouthpieces. We also built 14-inch front walls, which kept the heat back from the mouthpieces; and we have not had a stopped ascension-pipe during the time they have been in use.

Cowes, Feb. 11, 1897. A. THOMAS.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills presented and read the first time: Gravesend Corporation Water Bill,† Southampton Corporation Water Bill, Stirling Burghs (Gas) Bill.

Bills read a second time: Belfast Water Bill, Caerphilly Urban District Council Bill, Carnarvon Corporation Bill, Cowes Gas Bill, Clydebank and District Water Bill, Deal and Walmer Water Bill, Eastbourne Corporation Water Bill, Eastbourne Water Bill, Fylde Water (Transfer) Bill, Gravesend and Milton Water Bill, Harrogate Corporation (Water Transfer) Bill, Hunstanton Water and Gas Bill, Loughborough Corporation Bill, Lowestoft Corporation Bill, Lowestoft Water and Gas Bill, Malvern Link Urban District Gas Bill, Malvern Urban District Gas Bill, Newhaven and Seaford Water Bill, Newport Corporation Bill, Rhymney and Aber Valleys Gas and Water Bill, St. Anne's-on-the-Sea Gas Bill, Southampton Corporation Water Bill, Taunton Gas Bill, Torquay Corporation Water Bill, Tynemouth Corporation (Water) Bill.

Petitions have been presented against the following Bills: Clydebank and District Water Bill, Deal and Walmer Water Bill, Gravesend and Milton Water Bill, Stirling Burgh (Gas) Bill, Tynemouth Corporation (Water) Bill.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills presented and read the first time: Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex Water (Purchase) Bills, and the London Water (Purchase) Bill, of the London County Council.

Bills read a second time and committed: Ashford Urban District (Gas) Bill, Chichester Corporation Water Bill, Colne Corporation Bill, Dumfries and Maxwellton Water Bill, Dundee Corporation Bill, Edinburgh Corporation Bill, Huddersfield Corporation Bill, Kingston-upon-Hull Corporation Bill, Leicester Corporation Bill, Llandudno Urban District Council Bill, Manchester Corporation Bill, Newark Corporation Water Bill, Nottingham Corporation Water Bill, Perth Improvements Bill, Pwllheli Corporation Bill, St. Neot's Water Bill, Swadlincote District Gas Bill, Tuxford and District Gas Bill.

Petitions have been presented against the following Bills: Ashford Gas Bill, Ashford Urban District Gas Bill, Colne Corporation Bill, Edinburgh Corporation Bill, Kingston-upon-Hull Corporation Bill, Newark Corporation Water Bill, New River Company Bill, Nottingham Corporation Water Bill, Salford Corporation Bill, Weymouth Gas Bill, Weymouth Water Bill.

Sir F. Dixon-Hartland and Mr. R. G. Webster have blocked the Water Purchase Bills of the London County Council, the second reading of which is down for next Thursday. In the event of the second reading being agreed to, Mr. Woods will move as follows in respect of the East London Bill: "That it be an Instruction to the Committee that they have power to insert a clause in the Bill to the effect that the Essex County Council may, within two years of the passing into law of the East London Water (Purchase) Bill, promote a Bill in Parliament enabling the said Essex County Council to constitute an Essex Water Authority representative of the area in Essex within the limits of supply of the East London Company, with or without the county borough of West Ham as may be agreed with the Town Council of that borough; the cost of promoting such Bill to be paid by the said Essex County Council in the first instance out of the county fund, and to be refunded by the Essex Water Authority within twelve months of the constitution of the said authority, with compound interest at 3 per cent. per annum." Mr. Whitmore will move the rejection of the Chelsea Bill.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Feb. 12.

(*Before Mr. Justice* KEKEWICH.)

The Incandescent Gas-Light Company, Limited, v. Collins.

This was a motion to commit the defendant to prison for contempt of Court by disobeying an injunction granted against him.

Mr. TERRELL, Q.C., who appeared for the plaintiffs, said the writ was issued and served on Feb. 29, 1896; and on the 11th of July judgment was given in default of defence. The defendant—Mr. G. Collins, of New John Street, Birmingham, was personally served with the judgment on the 30th of November; and on the 9th of December, he again sold incandescent mantles which infringed the patent. These facts having been proved by affidavits,

Justice KEKEWICH said he observed that the contempt alleged against this defendant consisted in selling to an emissary of the plaintiff Company, and if this stood alone, he did not think he should have made the order. But he noticed from the other affidavits, which were very properly filed, that the defendant and others were endeavouring to set the plaintiffs at defiance; and this being so, he could not see that there was anything improper in entrapping him in this way. He should therefore make the order asked for.

Mr. TERRELL explained that, when mantles were sold to strangers, they were put on burners and fired; and after that it was impossible to say how they were made. It was therefore necessary to send someone to purchase who would preserve the mantle for analysis.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Saturday, Feb. 13.

(*Before Mr.* W. R. M'CONNELL, *Chairman, and a Bench of Magistrates.*)

The Assessment of the South Metropolitan Gas-Works.

This was merely a formal sitting of the Court, for the giving of a decision on a definite point which was raised and discussed at the previous sitting.

Sir E. CLARKE, Q.C., M.P., Mr. BALFOUR BROWNE, Q.C., and Mr. W. C. RYDE represented the Company. Mr. LITTLER, Q.C., C.B., Mr. MARSHALL, Q.C., and Mr. HORACE AVORY, appeared for the Greenwich Union; Mr. MARSHALL, Q.C., and Mr. GRAHAM, for the parish of Battersea; Mr. MARSHALL, Q.C., Mr. SINCLAIR COX, and Mr. CUTTER, for the Woolwich Union; Mr. LAWSON WALTON, Q.C., and Mr. T. T. PAYNE, for the Lewisham Union; and Mr. GRAHAM and Mr. ELLIOTT, for the parishes of Clapham and Streatham.

* A brief report of the proceedings at the meeting referred to, reproduced from the "Chemical Trade Journal," will be found in our "Technical Record" to-day.—ED. J. G. L.

† The poll of the ratepayers of Gravesend, as mentioned elsewhere, has resulted adversely to this Bill.—ED. J. G. L.

The CHAIRMAN: The question we have to settle is the amount which the property would reasonably be expected to let at, year to year, from the 6th of April, 1896. We are asked by the respondents to confine the evidence on which we may arrive at our conclusion to a period of twelve months ending Dec. 31, 1894. The appellants contend that we ought to receive evidence of facts and accounts up to June 30, 1895. I do not find any statute or decision which limits the particular period to which, and to which alone, we are bound to confine such evidence; and it seems almost absurd, in estimating the sum at which the property would let from April 6 onwards, to limit the figures applicable entirely to so remote a period as 1894. How far the evidence as to the first six months of 1895 may weigh with us, I cannot yet say; but we find we are bound to receive and consider it, and that we conform with the Act in doing so.

Mr. MARSHALL said both sides had looked into the question as to whether the point could be taken to a Divisional Court at the present stage; and they had come to the decision that it could not. Therefore he had only to suggest that an adjournment be taken, so as to allow the valuers on both sides to prepare alternative valuations. In the end, no doubt a case would be desired for the High Court.

Mr. BALFOUR BROWNE agreed that there should be an adjournment; but he did not see that at any time would there be a possibility of the respondents carrying the decision farther. It seemed to him to be entirely a matter of discretion for the present Court; and he did not think any point of law was involved. But even if there were a point of law, he agreed that the present was not the time for it to be raised. Mr. Marshall had said both sides would need to obtain alternative valuations; but he (Mr. Balfour Browne) did not intend to get out a valuation based on the 1894 figures.

Mr. MARSHALL said that, if at the close of the present proceedings, the case should be taken to the High Court, it might be that that Court would take the other view as to which year's figures should be adopted. Of course, it was entirely a matter for the other side to consider.

Mr. BALFOUR BROWNE said he could not be expected to have two cases.

Mr. MARSHALL said at any rate the parishes he represented—Greenwich, Woolwich, and Battersea—might want a case.

It was decided, after some further remarks, to resume the hearing of the case on March 6.

Mr. RYDE then reminded the Court that the parties had agreed as to the rateable value of the works. He understood that the respondents thought it desirable—and it certainly was desirable—that at some stage in the case the lists should be altered in accordance with this agreement, and that the alteration should be initialled by the Chairman.

Mr. SINCLAIR COX, for the respondents, agreed; and

The CHAIRMAN undertook to initial the alteration as requested.

Teignmouth Water Supply.—The Teignmouth District Council have decided to carry out works for the improvement of the water supply, at a cost of £7500. The Local Government Board have been asked to hold an inquiry at an early date into the application for permission to borrow the money, in order that the scheme may be carried out before the next summer season.

Withdrawal of the Benfleet Water Provisional Order.—The Essex County Council having criticized the various applications which are being made to Parliament for Water Orders for different parts of the county, and shown themselves adverse to private enterprise in the way of providing public water services, though they have confessedly done nothing themselves to remedy the evil of a non-supply, considerable astonishment and indignation has been aroused in the localities concerned. Mr. R. Varty, of Jarvis Hall, South Benfleet, has written to the Council stating that, as promoter of the application to the Board of Trade for a Provisional Order to supply the Benfleet district with water, he has, in view of the Council's refusal to grant their consent to the undertaking, decided not to proceed further in the matter for the present; but in the event of the local public bodies not providing a supply, he will renew his application to Parliament next November.

New Joint-Stock Companies.—A Company has been registered with a capital of £22,500, in £10 shares, to enter into certain agreements for the purchase and carrying on of the general ironmongery business of Messrs. H. and C. Davis & Co., of Camberwell Road and Clapham. The Light and Heat Company, Limited, with a capital of £180,000 in £4 shares, is to "carry on the business of an incandescent light company, and in particular to manufacture mantles, fittings, and any material and appliances in connection therewith, and to undertake the lighting of towns, streets, buildings, and other places, and the supply of mantles and other appliances in connection therewith, whether for public or private purposes; to acquire any patents, patent rights, and inventions, and to develop, deal with, and turn to account the same in such manner as the Company shall see fit; and with a view to the above objects, or any of them, to adopt and carry into effect an agreement, made on Jan. 29, between S. de Kacskowski of the one part and P. Dvorkovitz of the other part." An acetylene Company has been formed in Paris, with a capital of 100,000 frs., to exploit the Villejean-Frossard system of lighting.

The Accounts of the Walsall Corporation Gas Department.—The Walsall Town Council yesterday week received the annual financial report of the Gas Committee. It stated that the net profit for 1896 was £7538—an increase of £413 compared with the previous year; and the Committee had resolved to allocate £2538 which would remain after £5000 already voted had been carried to the reduction of the rates, as follows: £500 to the credit of the borough fund, making the total amount applied to the relief of the rates for the year ending March 25 next, £5500; £500 towards the expense of providing manual stoking machinery; and the remaining £1538 to the reserve fund. The Committee also reported that they had authorized the Finance Committee to include £5500 in the borough rate estimates for the ensuing year in respect of the estimated profits for the current year, and had determined that the charge to the Streets Committee for lighting and supplying the public lamps with gas should be reduced from £2 7s. 6d. to £2 5s. per lamp. The effect of this would be to relieve the general district rate to the extent of about £150 per annum. Mr. T. P. Brownhill, in proposing the adoption of the report, said in the last four years the price of gas had been reduced from 2s. 8d. to what was practically 2s. 3d. per 1000 cubic feet. The motion was agreed to.

MISCELLANEOUS NEWS.

BRENTFORD GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. HOWARD C. WARD in the chair.

The SECRETARY (Mr. W. Croxford) read the notice convening the meeting; and the Directors' report and the accounts, of which a summary was given in last week's issue, were taken as read.

The CHAIRMAN said he thought the Directors had good reason for being satisfied in meeting the shareholders on this occasion; for, despite the very great depreciation there had been in the value of the residual products, they had been able to earn the dividend for the half year, with the modest surplus of £32. This time last year, they had a deficit of between £5000 and £6000, and in the first half of last year £6800; so that he thought it would be very satisfactory to the shareholders to learn that they could pay, out of the profits of the past six months, the same dividend—12 per cent.—without touching the undivided balance. The consumption of gas, notwithstanding the competition of the electric light and oil, was still progressing in a marvellous manner. In the half year they had had an increase of 10 per cent. in the quantity sold; and what was very remarkable was this increase had taken place during a period which had not been marked by any extreme frost or heavy fog, but it had rather been weather that, one would think, would be unfavourable to the consumption of gas. It was not, however, simply in the case of their Company that an increase had taken place, but it would be found that almost every gas company had experienced the same thing. They did not have to go far to find the reason for this; it was due to the increasing desire of people of almost all classes to use gas as fuel. In one portion of their district at Ealing, they had the electric light competing with them; but, perhaps it would scarcely be believed, in the whole of the houses in which the electric light had been adopted in that particular district, they had only a decrease of £60 in their sales of gas. This was very remarkable. Then the use of stoves was increasing day by day; and almost every time the Directors met, they found there were 70 to 80 stoves and prepayment meters going out weekly. Indeed, during last year, the latter increased by 62·9 per cent. With their business advancing in this ratio—10 per cent. per annum—they must have the means to meet it. One day this year—Jan. 2—they sent out about 8 million cubic feet of gas, which was considerably more than they had the power to make in 24 hours; and therefore, if they had to place on the top of that a 10 per cent. increase, it was perfectly clear they must put down additional plant. The Directors had therefore decided to have an installation of water-gas apparatus at the Brentford works, which would, if required, produce about 1,200,000 cubic feet of gas per day; and which would be more readily available in case of fog or sudden demand than coal-gas plant. He did not know how far it would be necessary to extend the works this year at Southall; but no doubt it would be wise to make some provision for an increase there as well. In all probability, therefore, they would erect the same class of plant at both works. There was another matter on which they might congratulate themselves; and this was the outcome of their dispute over the dreadful assessments for rates that were made in the various parishes. The Directors had kicked at last. They could not stand it, and so had appealed. The result was they had been successful in reducing the assessment in the Brentford Union by the appreciable amount of £2343. Regarding the sale by tender of £30,000 of new stock, it was all taken up at above the fixed minimum price—the total premium realized being £33,001. Commenting upon the accounts, the Chairman said that during the six months they had spent £11,337 out of capital. The great bulk of this, however, was for additional mains, services, meters, and stoves, and only £948 for extensions of works. It would be seen by the accounts that they did not raise the new capital before it was absolutely necessary; for, although they had received £62,960 for the new stock, they had only a balance of £53,057. Therefore, on Nov. 1 last, their capital account must have been in considerable debt to the revenue account; but they would only have to pay one month's dividend on the £30,000 of new stock. Coming to the revenue account, he said that coal had cost them something more than in the corresponding period of last year. The price had been 8½d. per ton less; but he was sorry to say that, although the price had been that much lower, the quality of the coal had been much more than 8½d. per ton less. They had really very great reason to be dissatisfied with the quality of the coal that had been supplied; and the Directors had made very serious complaint to the contractors about it. The fact was they did not clean the coal as they should; and the result was the Company had all their labour, wear and tear, and that sort of thing expended upon coal that did not produce gas as it should do. Though they had been connected for a long time with their present contractors (it was with very great regret that the Directors had thought of taking such a step), they were determined, if they could not get better coal, to enter into contracts with other firms. It would be seen that purification had cost £2895, as against £2183—the increase being partly due to the fact that there had been considerably more coal carbonized; but the item would not have been so large if the coal had been cleaner. The carbonizing wages had diminished; and this they attributed entirely to the inclined retorts. It would, however, have decreased a great deal more if the coal had been of proper quality, because they would not have had to carbonize so much. The output of gas per ton was not at all what they usually expected; they had only produced 10,050 cubic feet per ton, and sold 9500 feet. The item of repairs and maintenance of works was somewhat smaller than this time last year—£12,229, against £12,331—and it would be reassuring to the shareholders to know that this sum included between £1400 and £1500 to wipe out the suspense account that was opened when they changed one retort-house at Brentford from the horizontal system to inclined retorts. There was only £950 left on that account; and this, they hoped, would entirely disappear in the current half year, together with part of the £1500 standing to the account of the reconstruction of No. 2 holder. The amount received for gas had risen from £94,064 in the December half of 1895 to £103,384 in the past six months, which was a considerable increase. The rental of meters and stoves had been going on much in the same way. Despite the fact that they had carbonized above 8000 tons more coal during the half year, the residual products were virtually the same as they were when 8000 tons less coal

was used. The receipts for tar were a little better; but this was due to an old contract. Coke, ammoniacal liquor, and sulphate of ammonia, however, were worse; and the total revenue from the residuals was £22,436, as against £22,413. The amount available for dividend out of the profits of the half year was £33,757, and the sum required for dividend was £33,725; so that they had £32 remaining to add to the undivided profits. In conclusion, he moved the adoption of the report and accounts.

Mr. J. Orwell Phillips seconded the motion.

The Chairman, replying to questions, said that they proposed to put the new plant at the Brentford works in an old retort-house which was not now in use; and at Southall, they had a great deal of land upon which they had power to manufacture and store gas. With regard to prepayment meters, they were put to some extra expense by having to employ more collectors; but so far as the meters and stoves themselves were concerned, they took care that eventually there would be no charge to capital on their account. They put the life of the stoves at eight years, and one-eighth of their original value was written off every year; so that, at the end of the eight years, although the stoves might not be worn out, they stood at nothing in the books. The life of ordinary meters they placed at twenty years; and they had a contract with the makers for repairing and renewing them. As to prepayment meters, they fixed their life at ten years, and dealt with them in the same way.

The motion was carried.

Dividends at the rate of 5 per cent. per annum on the preference stock, 12 per cent. on the consolidated stock, and 9 per cent. on the new stock were declared.

Resolutions were also passed re-electing the retiring Directors (Messrs. R. S. Adair and J. Orwell Phillips) and Auditors (Messrs. J. W. Field and Monier F. Monier-Williams).

The usual complimentary vote to the Chairman and Directors and officers te rminated the proceedings.

CRYSTAL PALACE DISTRICT GAS COMPANY.

The Half-Yearly Report and Accounts.

In the report of the Directors of this Company for the six months ending Dec. 31, 1896, which will be presented at the ordinary general meeting next Friday, they announce with satisfaction an increase of 9 per cent. in the quantity of gas sold. They remark that this, to some extent, meets the loss sustained on coke and ammonia, which realized even lower prices than those of the corresponding half of 1895. Of the various items of expenditure, some are at about the same rate, and others rather lower than then; resulting, in conjunction with the augmentation of business, in an increase of profit of £789 in the revenue account. This, however, is still not quite sufficient to pay all charges for interest and dividend. A sum of £20,000 of new ordinary stock was offered in December last to the consumers of gas in the Company's district. It was applied for nearly three times over, at a price that will yield £3 17s. 9d. per cent. to the investor. The Directors' object in thus placing the stock was to give the consumers an opportunity to invest in the Company, and thus secure their interest and goodwill. The number of new shareholders thus introduced is 170. The Directors recommend that dividends, less income-tax, be paid at the rate of 5 per cent. per annum on the preference stock and 5¼ per cent. per annum on the ordinary stock. To do this, taking as before the interest on the reserve fund, it will be necessary to draw upon the balance brought forward to the extent of £572 13s. 4d., which will leave £1060 14s. 6d. to carry forward, in addition to the ample reserve fund of £40,521. The report closes with a recommendation by the Board to increase the salary of the Secretary (Mr. Charles M. Ohren) by £100 per annum as from the beginning of the year.

The accounts accompanying the report show that £4573 was expended for capital purposes in the past half year; the greater portion of which was for new and additional meters and fixing them, and new stoves. This outlay brought up the total expenditure at the close of the year to £652,337; leaving an unexpended balance of £10,056. The total gas-rental in the half year amounted to £62,784, as compared with £58,182 in the corresponding period of 1895; the rental of meters (13,262 ordinary and 5005 prepayment), to £1321, against £1090; and of stoves (4421 ordinary and 3501 prepayment), to £933, against £607. Residual products returned £18,923, as compared with £17,263; and the total receipts amounted to £83,984, against £77,171. The outlay in the manufacture of gas came to £53,540, of which £35,300 was for coal and carburine, as compared with £48,213 and £30,859 respectively in the corresponding period of the previous year; distribution expenses were £5593, against £5810; management cost £2824, against £2877; and the total expenditure was £67,630, against £61,606—leaving £16,354 to go to the profit and loss account, as compared with £15,565 at the close of 1895. The amount available for division is £16,604; while this time last year it was £19,458. The works, under the supervision of Mr. Charles Gandon, M.Inst.C.E., produced in the past six months 545,525,000 cubic feet of gas, of which 489,698,000 cubic feet were accounted for. There were 53,902 tons of coal, 895 tons of cannel, and 40,283 gallons of carburine employed in the manufacture of gas; the estimated production of residuals being: Coke, 657,566 cwt.; breeze, 5738 yards; tar, 547,002 gallons; and ammoniacal liquor, 10,147 butts. There were 334 tons of sulphate of ammonia made, and 302 tons sold, during the half year.

NEWCASTLE AND GATESHEAD GAS COMPANY.

The Past Year's Report and Accounts.

The revenue of the Newcastle and Gateshead Gas Co r pany in the past year amounted to £236,644, and the expenditure to £172,010; leaving a balance of £64,634. Adding the undivided profits brought forward, £7852, makes a sum of £72,486 available for distribution. At the annual meeting of the Company on the 24th inst., the Directors will propose to appropriate this amount as follows: Interest on debenture stock and loans, £6835; second half-year's dividend at £4 17s. 6d. per share on the £617,946 of ordinary stock, £29,121—together, £35,956; making with the interim dividend of £29,121 paid in August £65,077, and leaving £7409 to be carried forward. In their report, the Directors state that there is a decrease of £2153 in the revenue, and an increase of £1231 in the expenditure. The returns from the sale of residuals show a considerable falling off, as compared with the year 1895; but this was almost counterbalanced by those derived from the greatly increased consumption of gas. This extra demand upon the Company's resources has necessitated the immediate extension of the plant, both for production and distribution. Arrangements have accordingly been made for the completion of the works in progress, and the commencement of a retort-house at Redheugh; the building of a governor-house, which will be furnished with plant of the most approved description; and the laying of several large leading mains, to improve the supply of gas to the extremities of the district. During the past year, 18½ miles of pipes were laid in extensions and renewals; 1828 new branches were laid, and 1800 old ones renewed; 1687 meters were repaired, tested, and re-fixed; 231 ordinary street-lamps were erected, and 34 specially large lamps fitted up for private consumers; and there was an increase of 110 cooking-stoves fixed on loan—the total number on hire being 2180. The Directors announce with regret that Mr. William Hardie had found it necessary, owing to impaired health, to resign the office he had held for 41 years as Secretary of the Company; and they expressed the hope that, with the rest afforded him, he may have the enjoyment of restored health. In consideration of his services, they have granted him a retiring allowance. Mr. Thomas Waddom, who has been 29 years in the Company's service, and was for some years Assistant-Secretary, has been appointed to fill the vacancy.

The accounts accompanying the Directors' report show that a sum of about £61,000 was expended last year for capital purposes—£38,141 being for the Redheugh works, and £14,959 for new mains and services. An amount of £36,526 was received by way of additional capital; but, owing to the large outlay above mentioned, the account has been overdrawn to the extent of £5023. The quantity of coal and cannel carbonized last year was £214,988 tons; the residual products being: Coke, 131,093 tons; breeze, 11,235 tons; and tar, 2,133,167 gallons. From the ammoniacal liquor produced, 1951 tons 10 cwt. of sulphate were made, the whole of which, with 136 tons of what was in store, was sold.

SHEFFIELD UNITED GAS COMPANY.

The Half-Yearly Report and Accounts.

The accounts for the six months ending Dec. 31 last, which will be submitted to the shareholders of the above-named Company at their meeting on the 8th prox., show that the amount available for distribution is £49,736; and after the payment of the usual dividend, there will remain a balance of £11,473 to be carried to the credit of the current half year. The receipts for gas amounted to £108,714; the rental of meters and stoves came to £5608—together, £114,322; residuals produced, £37,745; and the total revenue was £154,148. The manufacture of gas cost £85,907, of which £43,685 was for coal and £23,848 for repairs and maintenance; the distribution expenses were £9258; those connected with management, £4484; rent, rates, and taxes were £8739; and the total expenditure was £109,089—leaving £45,059 to go to the profit and loss account. A sum of £15,901 was spent in the past half year on new buildings and manufacturing plant. There were 91,656 tons of coal, and 23,034 tons of cannel carbonized; the estimated production of residuals being: Coke and breeze, 68,802 tons; tar, 7357 tons; and ammoniacal liquor, 3,484,000 gallons. In their report, the Directors state that, notwithstanding the reduction of 2d. per 1000 cubic feet in the price, which was in force during the whole of the half year, and which on the quantity of gas sold amounted to £9324 18s., there was an additional income therefrom of £2376 2s. 8d. This was due to the largely increased consumption, amounting to 113,670,000 cubic feet, or 11·2 per cent. more than in the corresponding six months of 1895. The construction of the new works at Grimesthorpe is being proceeded with, and the Directors trust to be in a position to commence making gas there in the winter of 1898. The whole of the retorts at Neepsend and Effingham Street were at work in December and January last.

BROMLEY GAS CONSUMERS' COMPANY.

The Half-Yearly Report and Accounts.

In the report to be presented by the Directors of the above-named Company at the half-yearly general meeting on the 25th ult., they state that the quantity of gas made in the six months ending Dec. 31 was 12 million cubic feet, or upwards of 12 per cent., more than in the corresponding period of 1895 (though the weather was not less mild and bright), and 14 millions in advance of the quantity made in the half year ending at Midsummer last. As in the case of other gas companies, the sales of coke, sulphate, and other residuals, had to be effected at low prices; but some of these showed a slight tendency to improve. The accounts accompanying the report put the total gas rental at £16,348; the rental of meters, £424; the revenue from the sale of residuals, £4262; and the total income, £21,304. The expenditure on the manufacture of gas came to £10,950, of which £8433 was for coal; on distribution, £213; on management, £1511—the other expenses making up a total of £14,329—leaving £6975 to go to the profit and loss account. The balance to the credit of this account is £6817; and the Directors will recommend the continuation of dividends at the rates of 11½ and 8½ per cent. per annum. This will absorb £5892, and leave a balance of £925 to be carried forward. Under the supervision of the Company's Engineer (Mr. W. Woodward), 11,892 tons of coal and cannel were carbonized in the past half year; the quantity of gas made being 113,917,000 cubic feet, of which 107,423,900 cubic feet were sold. The residuals produced were: Coke, 11,892 chaldrons; breeze, 1574 chaldrons; and tar, 123,295 gallons. Sulphate of ammonia to the amount of 82 tons was made, of which 56 tons were sold.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

The Bristol Gas Company will hold their 88th half-yearly meeting next Friday, when the Directors will report that, after providing for interest on the debentures and dividend on the ordinary stock, and carrying £10,298 to the reserve, there will remain a balance of £12,131 to the credit of next half-year's accounts. The Directors express their pleasure in stating that during the past year more gas was sold than in any similar period in the history of the Company. In the latter part of the year, a reduction of 2d. per 1000 cubic feet was announced, to take effect from the commencement of the present year. A dividend at the rate of 5 per cent. per annum on the nominal capital of the Company will be proposed. The accounts accompanying the report show that a sum of £5577 was spent for capital purposes in the six months ending Dec. 31, chiefly for new manufacturing and distributing plant. The revenue from the sale of gas amounted to £102,060, as compared with £95,619 in the corresponding period of 1895; residuals produced £24,706, against £25,069; and the total receipts were £129,730, against £123,371. The manufacture of gas cost £80,559, as compared with £73,731; distribution, £5433, against £5348; and management, £5328, against £5195—the total expenses being £99,981, against £95,005. The balance carried to the profit and loss account is £29,749; this time last year it was £28,366. There were 85,037 tons of coal and 10,080 tons of cannel carbonized in the half year; the estimated production of residuals being: Ordinary coke, 54,658 tons; cannel coke, 4760 tons; breeze, 7495 tons; tar, 1,022,644 gallons; ammoniacal liquor, 2,027,824 gallons.

It was reported at the annual meeting of the Bromsgrove Gas Company yesterday week that the year's working had been so favourable as to admit the payment of an increased dividend, the transfer of £100 to the reserve fund, and the carrying forward of a balance. Extensive alterations in the plant had, it was stated, been effected during the year, which had considerably increased the capacity of the works. An important matter, which adversely affected the profits, was a large increase in the poor-rate assessment, against which the Directors intended to appeal at the Quarter Sessions. The balance-sheet showed an available balance of £1346, with which it was proposed to pay a dividend of 7 per cent. on the ordinary shares, and seven-tenths of 7 per cent. on the "B" shares. The report (which also alluded to the death of the late Chairman, Mr. W. Jefferies) was adopted.

The Chairman of the Chester Gas Company (Mr. J. Gamon) could afford, at the meeting of the shareholders yesterday week, to take a magnanimous view of the introduction of electric lighting into the city, seeing that the demand for gas had proved in excess of that for the corresponding period of last year. He said the proprietors, and especially those who were in any way connected with the city, had sufficient public spirit to be proud of the position which Chester held, as compared with other cities of its size and population, in making public improvements and providing public advantages. The Company must admit that the electric light had advantages over gas as an illuminant for certain purposes and places; and they were glad for Chester to possess every advantage that the scientific knowledge and engineering skill of the present day could give by way of lighting. But, in making this admission, it must be remembered that gas, on the other hand, possessed advantages over the electric light for certain purposes and places; and that it was considerably cheaper than the electric light. It was gratifying to the shareholders to know that the Company's ordinary stock had never stood at so high a rate in the open market as the last two months. The Directors' report (which was noticed last week) was adopted.

The Elland Gas Company's annual accounts show a balance on revenue account of £4709, which, with the amount brought forward from the previous year, &c., makes a total of £5400. In addition to an interim dividend of 12s. per share, a similar payment on the ordinary shares is now proposed, making the dividend for the year equal to 12 per cent.

Moving the adoption of the report and accounts of the Launceston Gas Company at the recent annual meeting, Mr. D. Thompson stated that the undertaking was progressing steadily, and the consumption of gas was increasing. The profits for the year had not been so large as on some former occasions; but the cost of repairs had been heavy, partly because they had taken out the old main to St. Stephen's and laid a new one, which was paid for out of revenue. They had improved the mains throughout the town. There was an increase in the dividend from 6s. to 7s. per share, which had ensued through an alteration of their Articles of Association. Replying to a suggestion that the consumption might be stimulated by a further reduction in the price, the Chairman said that they could not reduce it at present without entrenching upon the reserve fund. There would be further heavy repairs to be provided for in the next year or two; and they had run as close to the margin as any Gas Company could do with safety. The Secretary (Mr. J. Treleaven) said there was some difficulty in charging a lower price for gas for cooking and heating than for that supplied for lighting. The works were now making up to their full capacity; and it would shortly be necessary to put in a new exhauster, and carry out other extensions. The report and accounts were adopted; and the dividend of 7s. per share was declared.

At the half-yearly general meeting of the Newport (Mon.) Gas Company on Monday last week, the Directors reported that the revenue in the six months ending Dec. 31 had been £21,353, and the expenditure £16,028. The Chairman (Mr. E. J. Phillips), in moving the adoption of the report, stated that there had been an increase in the sale of gas, though the Company had not received so much from the Corporation for public lighting by £150, owing to the extension of the electric light. However, the quantity of gas used was upwards of 6 million cubic feet more than it was in the preceding six months. The profit amounted to £5325, which would be sufficient to pay the usual dividend, and leave a small balance in hand. He expressed his pleasure at finding that prepayment meters were growing in favour, and that the use of gas for cooking and motive power purposes was extending. Referring to the great advance of incandescent gas lighting in Paris, where it has to a large extent eclipsed the electric light, he reminded the shareholders that they would find something of the same kind at Newport; for in the New Arcade, where they commenced with electricity, the Welsbach system had now been introduced, to the satisfaction of everybody. The report was adopted; and dividends at the rate of 5 per cent. on the "A" stock, 3¾ per cent. on the "B" stock, 3½ per cent. on the "C" stock and shares, and 2½ per cent. on the 5 per cent. perpetual debenture stock for the half year ending Dec. 31, were declared.

The profit realized by the Otley Gas Company in the past year amounted to £2475. Adding the balance of about £28 brought forward, there was a sum of £2503, out of which the interest on the mortgages and the interim dividend has been paid; leaving a balance of £1335. At the meeting of the Company next Saturday, the Directors will propose to deal with this sum as follows: Pay a dividend of 20s. per share on the "A" shares, amounting to £1000; write off £50 from the Provisional Order account; and carry forward the balance of £285. Under Mr. G. W. Lupton's management, the works carbonized last year 4571 tons of coal.

The Directors of the Scarborough Gas Company, in their half-yearly report, state that the net revenue, including £235 brought forward, amounts to £8407, which sum is subjected to a further charge of £1000 for retort alterations suspense account, leaving a balance of £7407. After providing for the dividends on the preference stock, they recommend the payment of the maximum dividends on all other stocks, and the carrying forward of £1635. The growing output of gas necessitates a rearrangement and extension of the purifying plant; and the Directors are giving this their consideration.

The report of the Directors of the Wakefield Gas Company for the six months ending Dec. 31 states that the amount available for division is £5810; and they recommend the usual dividends—£11 10s. per cent. per annum on 1000 shares of £25 each, and also on 3660 shares of £5 each; £9 per cent. per annum on 7340 B-5ths shares of £5 each; and £8 10s. per cent. per annum on the 2500 ordinary fully-paid £10 shares, also on the 2500 new ordinary £10 shares £4 paid—all clear of income-tax.

The consumption of gas in the district of the Wellingborough Gas Company in the six months ending Dec. 31, was 9 per cent. higher than in the corresponding period of 1895. The 36,997,490 cubic feet of gas sold for public and private lighting yielded a revenue of £5220; the sale of residuals produced £987; and the total receipts were £6370. The expenditure being £4397, there was a balance of £1973 to go to the profit and loss account. To the credit of this account there is a sum of £2275, out of which the Directors will recommend, at the meeting of the Company on the 22nd inst., the usual dividends of 5½ per cent. on the "A" and "B" and 4 per cent. on the "C" shares, free of income-tax, for the half year. Under the supervision of the Company's Engineer and Manager (Mr. J. T. Lewis), 3558 tons of coal were carbonized; and 38,844,500 cubic feet of gas were made, or at the rate of 10,917 cubic feet per ton. Of this quantity, as already mentioned, 36,997,490 cubic feet were sold, or at the rate of 10,397 cubic feet per ton, and 37,245,000 cubic feet, or 10,467 cubic feet per ton accounted for; the quantity lost being 4·11 per cent. of the make. Of the residual products, the coke available for sale was 9 cwt. 3 qrs. 25 lbs. per ton of coal carbonized; 42,905 gallons of tar were made, and 40,905 gallons sold; 60,820 gallons of liquor were produced, 7260 gallons bought, and 58,080 gallons used; and 23 tons 16 cwt. of sulphate of ammonia were made.

Water Companies.

At the recent half-yearly meeting of the Camborne Water Company, the receipts were reported to have been £1146, and the profit £769, out of which the Directors recommended payment of dividends of 10 and 7 per cent. on the respective classes of shares. Mr. W. C. Pendarves, who presided, said the accounts showed a rather smaller profit than last year; but considering the depression in the mining industry, he thought the proprietors might congratulate themselves that they stood as well as they did.

For the past six months, the Chester Water Company had a surplus of revenue over expenditure of £2363, which, with the undivided balance in hand, makes £9217. Deducting from this the cost of the Company's opposition to the Corporation Sluices Bill, £1941, and the interest on the preference capital, £450, leaves a balance of £6826. From this the usual statutory dividends are to be paid; and £4936 will then remain to be carried forward. The Directors, in their report, regret that the costs incurred in opposing the Sluices Bill had amounted to so large a sum; but they trust that the discussion before the Committee of the House of Commons, on the management and working of the Company and the treatment of the water, had tended to satisfy the consumers on the subject of the supply, and thereby strengthened the position of the Company generally. When the accounts and report were before the shareholders last Thursday, the Chairman (Mr. W. Brown) mentioned that it was proposed to provide a new filter-bed, which would enable the Company to add an additional 500,000 gallons of water to their storage.

The report presented by the Directors of the Cleveland Water Company at their half-yearly meeting last Wednesday stated that, after providing for preferential charges, there was a balance of £3647, which enabled them to recommend that a dividend at the rate of 8¼ per cent. per annum on the original and "A" shares, and of £5 15s. 6d. per cent. per annum on the "B" shares, free of income-tax, be declared; and that £125 be reserved for contingencies. This would absorb £2930, and leave a balance of £717 to be carried to the credit of the current half-year's account. The report was adopted.

A satisfactory record of progress was laid before the shareholders of the Colne Valley Water Company, at their meeting, at the Charing Cross Hotel, last Tuesday. The general results of the working during the past half year, as shown by the accounts, have already been noticed in the "JOURNAL" (see *ante*, p. 197); but, in moving the adoption of the report, the Chairman (Mr. J. R. Hollond) gave some fuller information. He said the total amount of the water-rates for the six months was £8477, as against £7894 for the December half of 1895—being an increase of £583. The advance for the half year to Midsummer last, in comparison with the corresponding period of 1895, was £603, which gave a total increase of £1186 for the year. The average for the previous nine years was £770. The number of new supplies added during the half year was 177, representing an additional revenue of £393 a year; and in the first half, the number was 242, representing £490—making together 419 new supplies, and an additional revenue of £883. The average for the previous nine years was 274 and £573 respectively. The total received for building supplies during 1896 was £530; while ten years ago the amount was about £400 less. As to the expenditure during 1896, the total showed a percentage of 39·46 on the gross income, which was lower than it had ever been before. The quantity of water pumped during

the half year was 220 million gallons, as compared with 216 millions in the similar period of 1895. The average weekly consumption was 8·6 million gallons during 1896; and the maximum reached during the drought was 11·8 millions. To show the progress that had been made in late years, he stated that the gross income had risen from £14,142 in 1893 to £17,255 in 1896—an increase of more than £3100. The total expenditure had advanced from £5725 in 1893 to £6810 in 1896, which was an increase of only £1100. The quantity of water pumped had risen from 361½ million gallons to 450 millions in the same period; and the population supplied, from 35,000 to 43,000. The aggregate amount of the new supplies laid on was £796 in 1893, as compared with £883 in 1896. These figures showed the considerable progress the Company had made at practically a smaller cost. He also supplied the following figures to show the advantages the Company had gained in working since the new beam engine was erected in 1890. In that year, the outlay on fuel, oil, lime, and engine repairs was £2106, as against £1380 last year. The income had risen from £11,536 to £17,251; the water pumped, from 320 million gallons to 450 millions; and the population supplied, from 31,000 to 43,000. He felt sure the shareholders would be gratified with the dividend it was proposed to pay on this occasion—viz., 4½ per cent. At June, 1890, it was 3 per cent.; but they had had an average increase since of ½ per cent. every two years. He also mentioned that it was expected that the new works now in course of construction would be finished in July; and that it was the intention of the Directors to shortly issue, by tender, 1200 new shares. Mr. Keyser seconded the motion, which was unanimously adopted. Resolutions were also passed declaring the dividend proposed, and re-electing the retiring Directors and Auditor.

Notwithstanding the excessive drought of last summer, the operations of the Dorking Water Company were financially successful. The receipts amounted to £1451; while the expenditure only totalled to £451—leaving a round £1000 as profit. Deducting the interest on mortgages, and adding the amount brought forward, the sum available for distribution was £1268. Dividends of 6, 7, and 8½ per cent. on the various classes of capital have been declared for the entire year, less 2½ per cent. already paid.

Additional services to the number of 151 were laid in the district of the East Worcestershire Water Company in the six months ending Dec. 31 last; raising the total to 4184, exclusive of Droitwich and Rednal. The consumption of water has steadily increased; the daily average pumped having risen to 595,282 gallons. The profit was £1405; and this added to £132 brought from the last account, makes a disposable balance of £1537, which it is proposed to carry forward. The Directors remark in their report that these results have been attained only by efficiency and economy in all departments.

At the recent annual meeting of the High Wycombe Water Company, the Directors reported a profit of £774. After paying out of this sum the interest on the debenture bonds, there was left a balance of £635. A dividend of 10 per cent., free of income-tax, was declared. A vote of thanks was accorded to the Directors and the Manager (Mr. J. F. Wicks). The latter, in acknowledging the compliment, referred to the progress made by the Company. He said that in 1886 the dividend was only 5 per cent., and after it was paid there was only a balance of £27 18s. 11d.; whereas now they were able to pay 10 per cent., and had in hand a balance of £130 19s. 5d. Another point was that during the past summer, though they had had an extraordinary time, so far as the weather was concerned, the head of water in their suction well had not diminished in the slightest degree.

At the ordinary general meeting of the Kettering Water Company to be held next Monday, the Directors will report that the revenue for the past year was £5038, as compared with £4874 for 1895; being an increase of £164. The profit and loss account amounts to £3185, inclusive of £303 brought forward. Deducting the interim dividend and the interest on debentures, &c., there remains an undivided profit of £1471; and the Directors recommend the payment of a dividend at the rate of £6 15s. per cent. per annum on the "A" capital, and of £4 15s. per cent. per annum on the "B" capital, both free of income-tax; making an average for the year of £6 10s. and £4 10s. 10d. This will absorb £1403, and leave £68 to be carried forward. The Secretary and Manager (Mr. T. A. Simpson) reports that the works are in good order, and that, notwithstanding great waste, there was never less than a year's supply in the reservoir during the past six months.

The proposal of the Southampton Corporation to purchase the South Hants Water Company's undertaking lends additional interest to the annual report of the Directors for the year ending Dec. 31. It appears that the profit available for dividend is £6674, out of which they recommend a dividend at the rate of 10 per cent. (free of income-tax), for the six months ending Dec. 31, on the ordinary, and 7 per cent. on the new ordinary shares (which, with the interim dividend at the rate of 5 per cent. and 3½ per cent. per annum respectively, makes 7½ per cent. on the ordinary and 5½ per cent. on the new ordinary shares for the year). This will absorb £5582, and leave £1091. From this the Directors propose to add £411 to the depreciation account, and carry forward £680. During the year £5000 additional debenture stock was issued by tender; and the premium—amounting to £1589—the Directors propose to add to the depreciation account, which, together with the £411 mentioned above, will bring that account up to £3500. Regarding extensions, the Directors have resolved to supply the parishes of Twyford and Compton, including the growing district of Shawford. During the year, 994 houses have been connected to the Company's system, giving an estimated increased annual rental of £1222.

In the report to be presented by the Directors of the South Staffordshire Water-Works Company at the half-yearly general meeting on the 25th inst., they state that the number of houses laid on during the six months ending Dec. 31 was 2126; making the total supplied 92,007. The gross amount of water-rates was £47,326, as compared with £46,070 in the corresponding period of the previous year. The Directors have transferred £2007 to the depreciation fund, raising it to £10,500. After providing for interest on the debenture and preference stock, the amount remaining for division (including £4247 brought forward) is £21,611; and the Directors recommend the declaration of a dividend for the half year on the ordinary stock at the rate of 6 per cent. per annum, less income-tax. The amount of the dividend being £17,255, there will remain £4356 to the credit of the current half year. The Company's Engineer (Mr. H. Ashton Hill, M.Inst.C.E.) reports that the whole of the buildings, machinery, and plant of the Company are in substantial order and repair.

The Stockport Water Company have for their Chairman an eminent Water Engineer in the person of Mr. G. H. Hill; but nevertheless they have to contend with all the troubles common to such undertakings. In laying before the shareholders at the recent meeting the results of the working of the past half year, the Chairman stated that the receipts showed an increase of about £780; but the expenditure had advanced by £867. He explained that the increase in the latter was largely accounted for by the fact that, in addition to pumping at Wilmslow and Woodbank, they had had to take a larger quantity of water from the Manchester Corporation, to meet the exceptionally dry season at the beginning of the half year. Then since 1883 rates and taxes had increased four-fold; and even from 1893 they had risen from £2000 to £2800. As to the finances, the accounts showed that, after paying the interest on debentures, amounting to £1126, the half-year's profit was £8295. This sum, with £913 brought forward from the previous accounts, left a balance of £9208 in hand. The report was adopted, and a dividend at the rate of 6½ per cent. per annum was declared on the ordinary stock.

The Directors of the Weardale and Shildon Water Company have reached "the goal of their anticipations," in being in a position to pay a 5 per cent. dividend. So said the Chairman (Sir David Dale) at the meeting of the shareholders on Monday last week; and he added that he saw no reason to doubt that the revenue would continue to grow. Dealing with the finances of the past year, he stated that the capital expenditure amounted to £3301; and in connection with this account, he referred to a decision of the Board to issue 2000 additional shares rateably among the shareholders, with the view of replacing, by the gradual paying up of these shares, the money now borrowed on mortgage. The shares were issued at £37 10s. or £12 10s., premium. There had been brought into the account for Dec. 31 £31,792 10s. payments on account of the total of £75,000, which the issue of 2000 shares at £37 10s. would produce. Thus there was left to be paid about £43,000 or £44,000. This would be applied to the paying off of the mortgages, which now stood at £50,320; and the balance of about £7000 would no doubt be derived from the funds in hand. The amount in the care of the Treasurer was £24,536; and the £7000 would bring this down to £17,000, from which £14,000 would be required for the payment of the dividend to be declared. The £75,000 represented by the 2000 shares would, with a 5 per cent. dividend, receive 3½ per cent. Coming to the revenue account, the gross receipts for 1896 were £40,134; and those for 1895 were £36,863—an increase of £3270. The working expenses for 1896 amounted to £8954; and in 1895 they were £7649—an increase apparently of £1304. But two items of £800 and £349 were special expenditure. The Directors had also thought it right to establish for the benefit of the workmen a scheme of old-age pensions, by which men who joined the association were guaranteed an old-age pension on reaching the age of 65; and in the event of their not attaining that age, a substantial payment was assured for the benefit of their families. The Company's portion of the premiums for the past year was £56 7s. The Chairman also referred to the death of Mr. H. Fell Pease, who, he said, was very assiduous in his duties as a Director. Mr. Reginald Pease (who has been elected to fill the place of his brother at the Board) seconded the motion, which was carried. A dividend of 13s. 1½d. per share was declared; making, with the interim payment, 5 per cent. per annum. A resolution was also passed, on the motion of Sir Theodore Fry, recording the shareholders' sense of the loss the Company had sustained in the death of Mr. H. F. Pease, who was a Director from the formation of the concern in 1866, and also took an active part in the management of its affairs.

The income of the Yeadon Water Company for the six months ending Dec. 31 last amounted to £1448, and the expenditure to £591—showing a net profit of £856. The sum available for dividend is £1019; and payments at the rate of £4 15s. per cent. per annum on the original capital and £3 6s. 6d. per cent. on the "B" stock are proposed. The total outlay on the works up to the end of the half year is £54,534.

Improvements and Water-Gas Manufacture at the Middlesbrough Gas-Works.—The Gas Committee of the Middlesbrough Corporation have adopted the following recommendations of the Sub-Committee appointed to consider the report of Mr. Corbet Woodall, who was called in to advise as to the best means of improving the gas supply: (1) The thorough repair of the existing nine beds of retorts, and also the seventh bed of the new set to be proceeded with without delay. (2) That, subject to the Sub-Committee visiting certain works which they have selected in order to examine the question further, the recommendations of Mr. Woodall as to the erection of a carburetted water-gas plant be adopted. (3) That the first section be placed on land at present owned by the Corporation. (4) That the adjoining cottages be purchased, and the new plant so designed that it can, in the future, be extended on to the site of the cottages. The main points of Mr. Woodall's report were published in the "JOURNAL" for the 26th ult.

Wimbledon District Council and Incandescent Gas Lighting.—The Mitcham Gas Company have submitted to the Wimbledon District Council the following tender for lighting by incandescent gas-burners, including the supply of gas, lighting from sunset to sunrise, and cleaning and repairing mantles: £3 5s. per lamp per annum, if the Council provide the mantles, chimneys, and burners, and £4 5s. if the Company provide them; £7 10s. per cluster of three per annum if the Council provide the mantles, chimneys, and burners, and £10 10s. if the Company provide them. It was explained by Mr. Crimp, at the last meeting of the Council that the number of public lamps in the district was 860. If the incandescent light were adopted, they would have to pay £4 5s. per lamp, to which must be added 2s. for painting—making the total cost in round figures £3700 a year. The cost of oil lighting, taking the average of the last two years (last year it was unusually large on account of the renewal of lamps) was £2365. Therefore the change from oil to gas lighting would mean some £1400 per annum extra, which was equal to a 2d. rate. There were something like 250 lamps in streets in which the Gas Company had no mains at present; and as the Council had been asked in the past to pay the expense of laying these mains, the cost would be even greater than the difference he had pointed out. There was a little discussion on the subject; but it does not appear from the report to hand that any definite move was made in the matter.

WIDNES CORPORATION GAS AND WATER SUPPLY.

Reduction in the Price of Gas.

At the Meeting of the Widnes Town Council last Tuesday—the Mayor (Major Alderman Wareing) in the chair—the Gas and Water Committee reported that, at a special meeting of the Committee on the 19th ult., letters from the United Alkali Company, Limited, were read. The Committee considered the charges for gas and water, and resolved that, from and after the 25th of March next, the price of gas to consumers within the borough should be as follows: To consumers below 3,000,000 cubic feet per annum, 1s. 10d. per 1000 cubic feet, less 2d. per 1000 feet discount; to consumers above 3,000,000 cubic feet per annum, 1s. 8d., less 2d. discount. They also resolved that, from and after the same date, the quantity of gas supplied through prepayment meters should be charged for at the rate of 33 cubic feet for 1d., instead of 30 feet as at present. With regard to the price of water, the Committee decided that no alteration should be made therein.

Alderman Timmis, in moving the confirmation of the minutes, said the Committee considered it was not desirable to make any alteration in the price of water, for various reasons, one of which was that the consumption had very much decreased, and the profits were not such as warranted them in making a reduction. With regard to the price of gas, this was on a very different footing. It would be within the memory of the Council that, when submitting the minutes of the Committee at the last meeting, when it was recommended that the retort-houses should be extended, it was pointed out that there was a possibility, or even a threat, that certain works in the town might make their own gas. The Committee discussed this, and the probability that the works might utilize their unemployed power to generate electricity; and, looking at the profits realized, they came to the conclusion that it was advisable to meet this contingency by making a reduction in the price of gas. With the alteration suggested, they hoped they would hear no more of gas being made in the town, or of electricity being introduced. The prices proposed were such as had never been offered by any gas company or corporation before. The net charges to large consumers would be 1s. 6d. per 1000 cubic feet, and 1s. 8d. to ordinary consumers; and then there was an increase of 3 cubic feet in the quantity allowed to the slot meter consumers per 1d. This was equal to a reduction of a fraction over 3d. per 1000 cubic feet, and very nearly brought the price down to the amount which the ordinary consumers were charged. There was a strong feeling on the Committee that even more gas should be given to the slot meter consumers for 1d.; but, on the figures before them, and on the unknown possibilities, they thought it better not to go farther than was absolutely right. They did not wish to give an advantage this year, and be compelled to ask for increased prices next. Of course, the changes would mean a loss of revenue for the time being. But their experience in the past had been that when they made reductions they very soon had an augmented consumption, which had given them as much revenue as they had cut away; and the increases had led to a reduction in the standing charges. What had occurred in the past they hoped would occur again, and he trusted that the action now proposed would lead to increased prosperity in the town.

Mr. Davies expressed his pleasure in seconding the motion. He remarked that in the Committee he had given his opinion that it would not have been possible to make any reduction except for the slot meter consumers; and he contended that they ought to treat these consumers as generously as possible. But, as the Engineer (Mr. Isaac Carr, Assoc. M.Inst C E.) had pointed out, a great many of the slot meters were being returned for repairs. The makers were under a guarantee to repair them for five years. At the end of that period, the repairs would be a charge upon the department; and what that charge was likely to be it was difficult even to estimate at present. They also considered that in granting a reduction of more than 3d. per 1000 cubic feet, they were making a greater concession to them than to the ordinary consumers. He was glad to be able to state that, owing to the reduction in the price of gas, he knew one firm in the town—not the United Alkali Company—who would consume at least 2 million cubic feet more gas for motive power. With regard to the profits, they were estimated at from £2000 to £2400. But he supposed the reductions would absorb about £1700 or £1800; so they hoped they were on the right side.

Some questions on the minutes having been replied to, the motion was carried.

THE GAS QUESTION AT SOUTHPORT.

Conclusion of the Local Government Board Inquiry.

Last Tuesday, Major-General H. D. Crozier, R.E., resumed the inquiry into the application of the Southport Corporation to the Local Government Board for a Provisional Order to amend the Southport Improvement Acts, 1871 and 1876, in the manner already set forth in the "Journal" (*ante*, p. 135).

The Town Clerk (Mr. J. D. Williams) appeared for the Corporation; Mr. Horridge represented the Birkdale District Council, who opposed the application.

The Town Clerk stated that since the last sitting, he had got Mr. Booth to make out a statement showing in detail the cost of enriching material last year, and what the cost would have been if they used no enriching material. The total amount saved would have been somewhere about £2900. He also reminded the Inspector that he had suggested that the Southport Corporation and the District Council should endeavour to come to some agreement. Well, they had had two meetings; but he was sorry to say that their overtures had failed. Under these circumstances, they were compelled to limit the application to Southport and Amsdale, leaving Birkdale out—in other words, to take the alternative clauses that were sent to the Local Government Board on Dec. 16. This would leave things, so far as Birkdale was concerned, exactly as they stood at the present time.

Mr. Horridge demurred to this. He contended that, from the 1871 Act and the subsequent Act, it was perfectly clear that the parliamentary bargain between the authorities was that there should be one gas supply, and one rate charged in Birkdale and Southport; but the effect of the Provisional Order would be to have for Birkdale a separate gas staff and a higher charge for gas. In the Act of 1871, the maximum price was fixed at 4s. per 1000 cubic feet; and the standard of gas for the two areas was the same. In 1876, the application was to increase the maximum price from 4s. to 4s. 6d.; and then the Corporation solemnly stated before the Parliamentary Committee that the bargain between the two authorities was that the same price should be charged. He referred to the report of the proceedings of the Parliamentary Committee, in which Mr. Littler, representing the Birkdale Local Board, said there was nothing in the Bill to prevent the Southport Corporation charging a lower rate to the inhabitants of Southport and a higher rate to the inhabitants of Birkdale, to which Sir Edmund Beckett, for the Corporation, replied: "If there is not, I say there ought to be something to prevent the Corporation charging a lower rate to the inhabitants of Southport than to the inhabitants of Birkdale." The bargain solemnly entered into was that Birkdale should have a rebate of 8d. per 1000 cubic feet of gas, 3½d. for the right of supply, and 4½d. for the use of the mains. In 1885, the Corporation of Southport did what no Corporation ought to do—they went back on their parliamentary bargain, and added 6d. per 1000 cubic feet to the price charged to the Birkdale consumers. Further, under the Act of 1871, the Birkdale people had to give notice to the Southport people when they were going to test the illuminating power of the gas supplied; and it was perfectly true that when the notice was given, and the test was made by the Silber argand, the gas did show something like 21 candles illuminating power. But Mr. Bellamy said very wisely to the Birkdale Council that they should take one official test and one unofficial; and when he made the unofficial test, the illuminating power was lower. Mr. Booth said there would only be a little saving in consequence of the proposed reduction; and he believed this was right, simply because the Corporation had not really been supplying gas of 20-candle power. It was really 16-candle gas by a breach which the Corporation were now endeavouring to get legalized. While the action with regard to the testing of gas before the High Court was pending, application was made by the Corporation to amend the Act relating to their gas supply; and according to the evidence given, the extra cost of this to Birkdale would be 2d. per 1000 cubic feet.

The Inspector: Why?

Mr. Horridge: Because they say they would have to invest an extra sum in order to supply Birkdale.

The Inspector: But I do not know why this should be charged to Birkdale.

Mr. Horridge replied that there was no doubt that it would be. If the Corporation would undertake before the Inspector that Birkdale consumers would not be charged more than those in Southport, there was an end to the whole matter.

The Town Clerk: So we will, if you withdraw the section as to the rebate.

Mr. Horridge (continuing) said the truth was that Southport intended to get a Provisional Order which was to give them a different supply, and put the cost on Birkdale.

The Town Clerk: I am not going to say anything on that point.

The Inspector: I think it is a point upon which the Corporation must tell me definitely and straightforwardly one way or the other; and I will adjourn the inquiry to let you talk it over, if you like. To my mind, it is a concise point.

The Town Clerk remarked that, if they supplied Birkdale through a separate main, he thought it was highly probable the cost would be charged to Birkdale because it would be laid for the special purpose of supplying Birkdale.

Mr. Horridge said they could not give the separate supply without, in effect, putting on Birkdale an extra charge for the different standard they would have. The figure which had been mentioned for the separate supply was £11,000, at forty years' repayment; and it would be repaid at something like a rate of 2d. in the pound. They did not, however, know whether it would be 2d. or 4d., because they were in this position—that in the Gas-Works Clauses Act of 1871, there was incorporated a clause for the limitation of profits; but the then Town Clerk of Southport very wisely, in the Act of 1876, expressly excluded those sections which related to profit. Consequently, Birkdale were in a helpless condition; and they could not check a single account. The Inspector had said on the first day of the inquiry that, if the Corporation were in favour of the proposed change, he presumed the ratepayers would be; but it was an extraordinary thing that the Corporation had not been able to call a single ratepayer in support of the application.

Mr. *C. R. Bellamy* was then called, and examined by Mr. Horridge. He said he was Gas Examiner to the Liverpool Corporation; and he had been Consulting Engineer to Birkdale for the last ten years. If Birkdale were left out of the present application, it would be necessary to have a separate main and separate arrangements at the Southport Gas-Works. He estimated that the amount required for interest and sinking fund on the capital expenditure would be about 2d. per 1000 cubic feet. There would be also extra cost of manufacture; and as Birkdale had no right of audit, the cost might be run up to a very serious item indeed. In Liverpool, they had a standard of 20-candle power; and he had found no difficulty in getting the people to use proper burners. Over 21,000 burners had passed through his office suitable for the Liverpool gas. The fish-tail burner (No. 4) was said by him to be the one most employed in Southport. He had tested this burner; and when used with London 16-candle gas, he found there was a falling off of 20 per cent. in the illuminating power, as compared with the gas at present used in Southport. There was no question that the Southport gas was better than that supplied in London. The difference of 20 per cent. meant that, while the consumer would lose one-fifth of the value of the gas, the Corporation would only gain about 1d. per 1000 cubic feet. It was better to use a high quality gas for illuminating purposes, because there was less consumption of oxygen, and consequently less vitiation of the atmosphere. When he had made tests at Birkdale without giving the Corporation three hours' notice, he had generally found that the results were worse.

Cross-examined by the Town Clerk: He had long been aware that the gas consumers of Liverpool were losing a considerable percentage of the quality of their gas through the use of improper burners; but it was only about two years ago that he made a special effort to bring about a better state of things. In 1894, he gave a lecture under the auspices of

the Liverpool Corporation on "Gas Consumption;" his idea being to get the people to adopt a burner suitable for a high class of gas, rather than to reduce the standard of gas to the poor burner used. On an average, the loss of light due to the use of an ordinary burner was about 30 per cent. He had tested the quality of gas made by a large number of authorities; and the average power of that supplied by corporations was about 19 candles, which was considerably higher than the parliamentary standard. He did not agree with Mr. Newbigging that there was a better diffusion of light with a low-quality than with a high-quality gas. He thought such an assumption was absurd. He did not believe there was very much difference between the flat-flame burner and the Silber argand. He remembered a Chairman of a Parliamentary Committee saying that they were satisfied that the argand was better than the flat-flame burner; but in that case all the conditions were altered. There was not merely a re-arrangement of the standard candle power; but the maximum price was abolished, the standard price was fixed, and the sliding-scale of dividends was introduced.

The Inspector said that as no agreement had been arrived at between the two parties, the question of the burner must be left to the decision of the Superior Courts.

Re-examined by Mr. Horridge: The statutory power of Widnes gas was 14 candles. The actual power supplied was 18 candles, tested by the "G" argand. The price was 1s. 8d. and 1s. 10d. per 1000 cubic feet.

The Inspector asked what was the difference in price between 16 and 20 candle gas. It was stated by one expert as 3d. per 1000 cubic feet.

Witness: This would be the difference under certain conditions.

The Inspector said he understood that the cost of enriching 16-candle gas to 20 candles was 3d. per 1000 cubic feet.

Witness remarked that, with the burner at present in use, the value of these four candles was infinitely more than 3d. to the consumer. His valuation was 7d. Continuing, he said the reason 20-candle power gas used to be made in London, was because it was supplied to the House of Commons. When other means of illumination were adopted in the House, the 20-candle gas was not thought necessary for ordinary lighting; and the standard was reduced to 16 candles.

Mr. *Isaac Carr*, Gas Manager to the Widnes Corporation, was then called. He said he agreed with Mr. Bellamy as to the advantage of a higher illuminating power. The price of Widnes gas was 1s. 10d. and 1s. 8d. per 1000 cubic feet net; but his Committee had recently unanimously resolved to reduce it to 1s. 8d. and 1s. 6d. net. Widnes was similarly situated to Southport in regard to the coalfields. The cost of making their gas last year, including all charges, was 1s. 2½d. per 1000 cubic feet—that was for 18½-candle gas.

Cross-examined by the Town Clerk: In order to make a comparison between one place and another, the factors to be taken into account were the geographical position, the railway accommodation, and the management. The consumption per mile of main also had its bearings. Widnes was not a closely populated district. He did not know the acreage precisely; neither did he know the acreage of Southport. The consumption within the borough of Widnes was 160 million cubic feet; and their leakage was 6½ per cent. They supplied not quite 15 million cubic feet outside the borough. Their charges for outside supply ran up to 3s. 3d. per 1000 cubic feet.

The Town Clerk remarked that the cost of making gas at Widnes struck him as being very low. He asked witness if he knew of any other place at which the cost was so low.

Witness replied that it was so at Sunderland and Newcastle-on-Tyne.

I mean relatively situated?—I do not know of any works that manufacture it at such a low figure as ourselves; but I know places where the price is very near it.

Witness, in further cross-examination, said that the cost of manufacture depended to a great extent on what was paid for coal. At Widnes, they paid 6s. a ton delivered. He was not surprised to hear that Southport paid 10s. 6d. a ton, because they bought screened coal, whereas at Widnes they obtained slack. They produced with this slack gas of 16-candle power, measured through the "London" argand. They used tar for enriching purposes. He considered the cost of manufacture at Southport was very much above the average; and he saw no reason why it should be 2s. 2½d. per 1000 cubic feet. He considered there was not the relative difference in the working out of slack and screened coal that the difference in first cost would seem to indicate.

Mr. Horridge said that any provision in the suggested Order which stated that Birkdale were not to be charged more than a certain sum would be perfectly unworkable, unless they had some means of seeing they were not being charged too much. They were entitled at present to gas of 20-candle power. Of the 8d. per 1000 cubic feet rebate which Southport paid them, 3½d. was for the right of supply—giving them a sort of royalty; and when they found that Southport made gross profits equal to the difference between 2s. 2½d. and 3s. 6d. on every 1000 cubic feet, he did not wonder that it paid them. Therefore he did not think this ought to affect the price. So much of the 4½d. as the Local Government Board thought ought to be differentially put upon the price of gas, he would have no objection to. Of course, Birkdale saved the expense of mains; but the Town Clerk said they were fortunate enough to be able to do their mains at 2d. per 1000 cubic feet, and therefore when Birkdale paid 4½d. they were paying 2½d. more than the cost. He suggested that Birkdale should not be charged more than 3d. per 1000 cubic feet on the relative price to Southport. He would not give them 3d. if there was no rebate. He should say Birkdale was entitled to gas at the same price as Southport, if there was no rebate.

The Town Clerk pointed out that would mean that the price in Southport would be higher than in Birkdale. They had not the slightest objection to assimilating the prices; but the rebate was the factor.

Mr. Horridge said that was not correct. Southport were charged 3½d. per 1000 cubic feet for the right to supply gas; and last year they got 1s. 2d. in the pound off the rates, none of which went to Birkdale. Therefore they had to pay 3½d. per 1000 feet for the right to make their profit. All the consumers ought to be on the same footing, excepting their proportion for the expense of the mains.

The Town Clerk, in reply to the Inspector, said that Southport consumers were charged 3s. per 1000 cubic feet.

The Inspector said Mr. Horridge suggested that 3d. should be added to the 3s. per 1000 feet. From that must be deducted 8d. paid to the Birkdale District Council; and 2d. had to be put on for the additional cost of mains. This made the charge 2s. 9d., at which price Southport would be paying 3d. per 1000 cubic feet more for their gas than Birkdale; but they got 1s. 2d. in the pound off the rates.

The Town Clerk: That is pure fiction. It is not 1s. 2d. in the pound.

Mr. Horridge: Mr. Booth stated it was 1s. 2d. in the pound.

The Town Clerk said that was in 1895, when they made a big profit; but that was an exceptional year.

The Inspector thought it would be a good thing if they could make some arrangement, because he could see it would not do to have two prices ruling. Birkdale could not expect to have 20-candle gas at the same price as 16-candle; and Southport would have to add 3d. for the extra cost of making gas of this quality.

Mr. Horridge said what he proposed was that there should be a clause saying that Birkdale should not be charged more than so much per 1000 feet above Southport.

The Inspector again suggested that the parties should come to terms. Such an arrangement was highly desirable.

After an adjournment for luncheon,

The Inspector said that the position of Birkdale was this: Assuming that the up-keep of the mains was the same as in Southport—2d., or thereabouts, per 1000 cubic feet—Birkdale got a rebate of 8d. from Southport, and the latter charged 6d. per 1000 cubic feet more, so that the two practically balanced one another.

Mr. Horridge: And Southport gets its monopoly for nothing.

The Inspector said Mr. Horridge contended that this position was not in accordance with the terms laid down when the Act of 1871 was passed. On the other hand, Birkdale did not appear to have contested the legality of the action of Southport. They had grumbled; but they had paid.

Mr. Horridge said it was not quite accurate to say they were paying the same price. The gas consumers and ratepayers were not identical. The gas consumers paid 6d. more; and the Board, as representing the ratepayers, got the rebate for the benefit of the rates.

The Inspector pointed out that Birkdale got the benefit of the 6d.

The Town Clerk said that, in 1895, the Corporation found they were making a loss on the transaction, and adopted the differential charge.

The Inspector said that Birkdale wanted to get back the 6d. they had acquiesced in losing.

Mr. Horridge would not admit that they acquiesced. All he asked now was that Birkdale should not have to pay the extra cost of a separate supply.

The Town Clerk remarked that, if Birkdale did not join them, the Corporation had the alternative clauses which would leave the Act as it was, and give the Corporation power to charge Birkdale up to 4s. 6d. per 1000 cubic feet.

The Inspector said it would be much pleasanter if an agreement was arrived at.

Mr. Horridge asserted that he could get nothing from the Town Clerk. The latter refused to say that they would not make an extra charge. He (Mr. Horridge) was prepared to accept a differential charge of 5d. per 1000 cubic feet—3d. for the extra cost, and 2d. for the use of the mains—leaving the gas at 20-candle power as at present.

The Inspector: That is to say, if you charge 3s. per 1000 feet in Southport for 16-candle gas, Birkdale would pay 3s. 5d. per 1000 feet for 20-candle gas, and get 8d. rebate. Birkdale would then be 3d. per 1000 cubic feet under the Southport charge. Would that be acceptable to Southport?

The Town Clerk: Certainly not. I regard it as preposterous. Replying on the whole of the proceedings, he admitted that, since the passing of the 1871 Act, and for some time afterwards, there was only one charge; but it was the maximum charge of 4s. per 1000 cubic feet. Between 1871 and 1876, a Board of Trade inquiry was held; and the anomalous position of Southport under the Act of 1871 was pointed out by witnesses for the Corporation, who contended that they ought to have the mains or supply the gas in bulk at the Birkdale boundary, leaving the Birkdale Board to deal with their own customers when complaints were made of inadequate pressure. The Corporation went to Parliament for the purpose of obtaining the mains at a proper valuation; but Birkdale strenuously opposed them. The question of the ownership of the pipes was discussed before the Parliamentary Committee; for Sir Edmund Beckett, on behalf of the Corporation, said: "We offer to take the pipes on any terms the Committee think fit." If Birkdale had withdrawn opposition to the Bill, and handed over the mains to the Corporation, he had no doubt the Corporation would have acceded to the wish of the Birkdale authorities that there should be no differential price. As to the mains now, they said they were of insufficient capacity to enable them to keep up a proper pressure without doing an injustice to the consumers of Southport. The Corporation argued that the Act of Parliament of 1871 intended that the Birkdale authorities should give them every assistance to develop the gas consumption locally; but Birkdale had not done so. Mr. Horridge had spoken of big profits—selecting a record year for the purpose; but figures which had been compiled by the Borough Accountant showed that, while Birkdale had received in rebate £23,000, the Corporation had made a profit on the supply during the same period of £12,000. Birkdale, therefore, received nearly double the amount that Southport did. If Mr. Horridge had chosen some other year than that which had been selected, he knew perfectly well that the profits would be found to have been hardly anything at all; and that on the transaction with Birkdale, they had suffered an actual loss. Further, the way his learned friend went over the price was misleading; and in this connection, they should remember that trade profit was one thing, and profit within the meaning of the Act of 1847 was another. The trade profit in 1895 might, or might not, have been as much as his learned friend stated. It was large, no doubt; but to suppose that it gave them an indication of the profit within the meaning of the Act, which provided for a reserve and insurance fund, was entirely misleading. As a matter of fact, they had come in for nothing over 10 per cent.

Mr. Horridge (interposing) said they would find as much as 12 and 13 per cent. had been paid.

The Town Clerk replied that if his learned friend would refer to section 30 of the Act of 1847, dealing with this question, he would discover that the Corporation had the power to make up back dividends. He had taken the average percentage. A great deal had been said about a separate supply; but they must consider that only one-sixth of the consumers were determined on this policy. It would be a monstrous thing

to permit one-sixth of the consumers to come there and dictate to them what course to pursue. The position was intolerable, and one which he ventured to say no Committee of the House of Commons would tolerate. He admitted that the two powerful witnesses were of opinion that the London standard would be preferable to the one the Corporation suggested; and he had no doubt the Corporation would take the advice of their own expert witnesses in this respect. A great deal had been made of the cost of enrichment; but they would observe that all the evidence that had been adduced on this point referred to present prices, and it was a notorious fact that the prices of enriching materials were low now. He admitted that the introduction of oil as a medium of enrichment was a revolution; but he had never seen the man yet who could assure him that the fluctuation which had taken place in the price of cannel might not also occur in the price of oil. It was impossible to say how things might go in the oil market a few years hence. At any rate, the possession of the power they applied for could not do any harm. The Gaslight and Coke Company possessed the power for many years, and they chose the proper moment for exercising it; and after once reducing the power of their gas from 20 candles to 16 candles, it had never been suggested, as far as he knew, that they should go back to the former quality. High-power gas, in fact, had become an anachronism; and 98 per cent. of the gas making authorities throughout the kingdom, had something like the lower standard which Southport desired. He did not say that all those authorities had chosen to act down to the limits of their power; but they used their own discretion in the matter. It yet remained to be shown that the Corporation of Southport were not as competent in this respect as anyone else; and if the power were given to them, he had no doubt they would exercise it at the right time.

It was agreed, on behalf of the Corporation, that the standard given by the alternative application should be 16 candles, and that the maximum price should be 4s. per 1000 cubic feet.

The inquiry then closed.

At the meeting of the Southport Town Council last Tuesday, Mr. Dimond, in moving the adoption of the minutes of the Gas Committee, said he had hoped to be able to report at that meeting that the dispute between Birkdale and Southport with regard to the gas supply had been amicably and satisfactorily settled; but he regretted to say that things remained exactly as they were—a fact which he attributed mainly to the pertinacity of the Birkdale District Council in insisting upon the strict letter of the 43rd section of the Act of 1871 being carried out. Mr. Dewhurst seconded the motion, and expressed regret that so good an opportunity of settling the dispute on the gas question had been lost. The minutes were adopted.

OPENING OF NEW GAS OFFICES AT HUDDERSFIELD.

Alderman Stocks on the Progress of the Gas Undertaking.

Last Thursday afternoon, Alderman B. Stocks, the Chairman of the Gas Committee of the Huddersfield Corporation, performed the ceremony of opening the new offices for the Gas Department of the Corporation. The officials have for a long time been cramped for room; and, after some consideration, a block of buildings at the north-west corner of the works was purchased, and converted into offices at a cost of about £500. The basement contains a kitchen, strong-room, and lavatory. On what may be called the ground floor are the show-room for gas appliances of various kinds, and the clerks' offices; on the first floor are a spacious Committee-room, offices for the Gas Engineer, and a lavatory; and on the second floor are the drawing offices and two general offices, with two good storerooms overhead. These form the front block. At the rear of the offices, there are blocks of buildings which are used for a variety of purposes—in fact, it is proposed to do there practically the whole of the outdoor departmental work, employing between forty and fifty men, according to the time of the year. The ground floor of one block is devoted to a main and service layers' workshop; the first floor is used as a gas-fitters' and meter-repairing shop; and the second floor is a storeroom for meters and fittings. A second block of two storeys is used for meter-testing and other purposes; and there is a painting-shop and a messroom, and other premises. The total area of which these premises form a part will be about 10 or 11 acres. The show-room contains many samples of gas cookers and heaters and lighting appliances, either for direct purchase or for hire. The furnishing of the offices and other rooms is not quite finished; but so far as the work has gone, it has been done satisfactorily.

The members of the Corporation assembled at the Town Hall and proceeded to the new offices, where the Deputy-Mayor (Alderman Glendinning, J.P.), in the absence of the Mayor (Alderman J. Lee Walker, J.P.) through illness, presented a silver-gilt key to Alderman Stocks, who performed the opening ceremony. He then delivered an address, in which he gave a number of interesting particulars relative to the gas undertaking. He said that Huddersfield was supplied with gas by a Company from 1821 to 1871, when their works were acquired by the Corporation for £140,000. This was a high premiated value, and included an item of £10,063 as floating assets. The weight of coal and cannel carbonized in 1871 was 20,467 tons; but since then the capacity of the works had been more than doubled. In 1889, in conjunction with Mr. J. Sugden, he procured the introduction of plant for the manufacture of sulphate of ammonia. At that period they were selling their ammoniacal liquor to contractors, who were getting a large profit from its utilization. The capital cost of the plant amounted to £1769; and the gross profit resulting therefrom to the year ending March, 1896, had been £9000. After allowing 20 per cent. for interest on the capital, and repairs and maintenance of the plant, amounting to £2122, there remained a net profit of £6878. The capital account of the gas undertaking in 1889 was £264,138, which was equivalent to £6 4s. 5d. per ton of coal carbonized. The capital account for the year ending March, 1896, was £382,299 19s., or £6 9s. 5d. per ton of coal carbonized. The total expenditure on the manufacture of gas for the year 1889, including all charges, was £44,833 8s. 1d., or 21s. 0¾d. per ton, as compared with £52,271 13s. 1d., or 17s. 8¾d. per ton, for 1896; the total revenue being £65,671 12s. 8d., or 30s. 10d. per ton, in 1889, as compared with £76,884 6s. 1d., or 26s. 0½d. per ton, in 1896. During 1889, 42,585 tons of coal were carbonized, as compared with 59,032 tons in 1896. Of the quantity used in the former year, 66 per cent. was cannel. The average cost of material used was 10s. 9½d. per ton; and the price of coal, only 7s. 6½d. per ton. During 1896, 1895, and part of 1894, nothing but ordinary coal was used in the production of gas, in conjunction with oil and oxygen for enriching purposes. The average cost of material used in 1896 was 8s. 4½d. per ton, including the oil. As compared with their neighbours, the manufacture of gas, including all charges, amounted for Huddersfield to 17s. 8½d. per ton of coal carbonized; to 18s. 2½d. for Halifax; to 18s. 8¾d. for Leeds; and to 20s. 4½d. for Bradford. The total revenue amounted to 26s. 0½d. for Huddersfield, 24s. 8¾d. for Halifax, 25s. 1½d. for Leeds, and 26s. 2¼d. for Bradford. The capital account of the respective undertakings per ton of coal carbonized was: Huddersfield, £6 9s. 5d.; Halifax, £5 13s. 8d.; Leeds, £4 6s. 1½d.; and Bradford, £4 0s. 2d. In addition to this, the works in question were partly built upon freehold land; whereas in Huddersfield they paid an annual sum of £1025 17s. 6d. ground-rent, which, if capitalized, would add very considerably to the already overburdened capital of the undertaking. For this reason, strenuous efforts had been made during the past few years, and must continue to be made in the future, to reduce the still existing premiated capital account to the real value of the undertaking, and thus enable the Corporation to sell gas cheaper. Huddersfield gas was being sold at a lower rate relatively than in any of the towns named. Another great distinction between Huddersfield and the neighbouring places, as regarded the price of gas, was the fact that for heating, cooking, and motive power purposes, for which some 14 per cent. of the total output was sold, it was charged at the rate of 2s. per 1000 cubic feet, less 5 per cent. discount. None of the other places made such a distinction. For public lighting in Leeds and Halifax, the same price was charged as to private consumers. In Bradford, however, no charge was made for it. Huddersfield was unfortunately situated in having no direct railway communication with the works; receiving only 4s. 7½d. per ton of coal carbonized, against 5s. 7d. at Halifax, 5s. 5d. at Leeds, and 5s. 3d. at Bradford. The disadvantages of Huddersfield's local position, compared with their neighbours, was equivalent to a loss of 1½d. per 1000 cubic feet; in addition to which there was the heavy capital per ton of coal carbonized, ground-rents, and rates, which were responsible for an extra cost of 3¼d. per 1000 cubic feet, or a total of 4¾d. above the average in the three towns mentioned. The average price received for gas sold in Huddersfield was 2s. 4¾d. per 1000 cubic feet; while in the three towns named it was 2s. 1¼d. So that, given the same facilities in manipulating residuals, Huddersfield would be able to sell gas at 2s. per 1000 cubic feet. Just before the appointment of Mr. Herring as Engineer and Manager, in succession to Mr. Burgess, in 1892, he presented a report, which showed that it was necessary to remodel the works throughout. The scheme was estimated to cost £98,500; but it had been completed for £2107 14s. 11d. less than the estimate, and the working results obtained had more than fulfilled the anticipations of the Committee. The cost of the manufacture of gas had been reduced from 23s. 6d. per ton in 1890 to 17s. 8½d. in 1896. The offices now opened were adapted to their requirements, and had been obtained at a great saving in cost, as compared with the erection of new premises. Formal votes of thanks were afterwards passed; and the party then inspected the gas-works.

CANNOCK DISTRICT GAS SUPPLY.

Amalgamation of the Cannock and Hednesford Gas Companies.

Some months ago, Mr. T. Newbigging, M.Inst.C.E., made a structural valuation of the works of the above-named Companies, with a view to the amalgamation of the two undertakings. The share capital of the Cannock Company was £8800, in £5 shares; and they had a loan of £584 from their bankers. They paid 10 per cent. dividend, had a reserve fund amounting to £1946, and charged 3s. 9d. per 1000 cubic feet for their gas. The share capital of the Hednesford Company was £8000, in £10 shares; and they had raised on loan £1500. They paid 5 per cent. dividend, had a reserve fund of £200, and charged 4s. 7d. per 1000 cubic feet for their gas. Mr. Newbigging put the structural value of the Cannock Company's works and plant (on a freehold site), at £10,502; that of the Hednesford Company's works and plant (on a leasehold site), at £9042—making together, £19,544. He recommended the amalgamation of the two concerns, and the combination of the reserves. He thought the borrowed capital should be £2000; and that the shares in the new Company should be of the nominal value of £10, with a certain number of £1 shares (tenths) to meet the exigencies of allotment. Giving the shareholders in the Cannock Company one £10 and two £1 shares for each £5 share, and those of the Hednesford Company one £10 and one £1 share for each £10 share, the total capital (share and loan) would be £31,920, which would be much in excess of the structural value. But by giving the former shareholders six £1 shares for each £5 share, and the latter 5½ £1 shares for each £10 share, the total capital would be £16,960; and assuming that, after amalgamation, it was decided to manufacture gas at one works only (which would involve the sacrifice of capital, owing to a portion of the buildings and plant having to be abandoned), this amount of capital would about represent the structural value. Mr. Newbigging recommended this apportionment as being entirely free from objection; and, moreover, it would place the shareholders in each Company in much the same position as regards annual interest as they then occupied. He pointed out that the economies which would be effected by manufacturing all the gas at one station would be considerable; and assuming that the Cannock works were selected, and the Hednesford site was reserved for storage, some extensions of the retort-house plant and a new 8-inch main between the two places would be required. The amalgamation has since been carried out; the Company's capital being £40,000, in £1 shares. The new Board of Directors has been chosen from the old Boards—Mr. W. Jones, a Director of both, being elected Chairman, in place of Mr. T. H. Cope, who, after filling the position of Chairman of the Cannock Company for about ten years, has lately retired through ill-health. Mr. J. Williamson, the Chairman of the Hednesford Company, is Vice-Chairman. Mr. T. Smith, the Secretary of the former Company, retains this

post in the amalgamated concern; and Mr. T. Cross takes the management of the entire works. The make of gas by the two Companies last year was about 23 million cubic feet—rather more than 13 millions at Cannock, and about 9 millions at Hednesford. When the additional mains are laid and the two stations are connected, the new Company will have 22 miles of mains. As these will be all in a mining district, Mr. Cross will have to be on the alert to keep down his unaccounted-for gas, which was very high with the Hednesford Company.

THE GAS EXHIBITION IN NEW YORK.

American gas papers which arrived last Saturday contained short notices of the opening, on Wednesday, the 27th ult., of the gas exhibition organized by the Gas Industries Company in Madison Square Garden, New York, to which reference has already been made in the "JOURNAL." The time for opening was eight o'clock in the evening; and, promptly to the minute, the public were admitted. We learn from "Progressive Age"—the Editor of which (Mr. E. C. Brown) has been the prime mover in the undertaking—that, notwithstanding the inclemency of the weather, for the night was very stormy, nearly 10,000 people stood outside for about half an hour. On passing into the building, they found everything in its place, and every exhibitor ready to afford instruction in connection with his special goods. We are told that the visitors literally "swarmed the corridors;" and many were the expressions of delight at the spectacle presented to their view. The programme which had been arranged for the opening ceremony was set aside, "owing to the extent and fascinating interest of the assemblage." Our contemporary does not furnish any particulars of the exhibits, but gives extracts from the articles which appeared in the New York and other papers. A brilliant feature of the exhibition, which was to close on the 6th inst., was the Tiffany Gas Tower. This imposing structure, which stood in the centre of the exhibits, rose to a height of 60 feet, and was composed of eight sections, representing as many periods in the development of gas as an illuminant. Each of these divisions, rising one out of the other, diminishing in size as they ascended, was ornamented with arches, crockets, finials, and canopies, worked out on purely Gothic lines. Coloured lights were worked in here and there throughout the entire structure. The pinnacle of this "tabernacle of light" represented the first section, which passed into a deeper yellow at the commencement of the second section—the latter standing for another period of gas development—then into an orange, from an orange to a red, and from a deep red into a blue. On the exterior of the structure there were 2251 lights; the interior being supplied with 688 lights, all arranged so as to form part of the ornamentation, while illuminating the various coloured glasses and jets so liberally displayed throughout. Fountains and showers of water flowed through the tower; the water finally passing into steam, and escaping into the upper section. The "American Gaslight Journal" refers to the opening of the exhibition as follows: "The programme called for 'set' opening ceremonies; but as the public demanded admission to the exhibition, the managers, preferring to admit them rather than wait upon the ultra-convenience of those who were named to baptize the 'exhibition child,' admitted the public, who had the satisfaction of witnessing, without delay, that, while the incandescent electric light, as through the best claims of its discoverer to commerce—Mr. Thomas Alva Edison—was held to be the light of the rich, gas was and is the light of those who can afford to have comfort and service from an illuminating medium that cheaper meets their wants. The effect produced in the illumination of Madison Square Garden, under the gaseous method of lighting it, has not been excelled, nor even reached, by any of the varied samples of electric incandescent lighting tried; and it is also satisfactory to add that the atmosphere was vastly better to breathe than when electricity was depended upon in prior exhibitions to light the premises. We think all of those who attended the exhibition on the opening night will agree in the opinion that the illumination of the amphitheatre was perfect in volume, was complete to the eye, and satisfactory to the other physical correlative senses. The chief credit for this process should be granted without dispute or contention to the sensible efforts of the Welsbach Company; for, however much we may differ over its commercial practices, the fact remains that the Company was the promoter of the original way to stay the insidious advances of the pokerish light of the rich. The illumination of the hall devoted to the illustration of how to cook by gas was defective, not through the fault of the Gas Industries Company, but rather through the objections of the Garden proprietors, in the instance of the refusal of the latter to permit the proper piping of the place. Nevertheless, one of the divisions of the exhibition, even on the opening night, that held for at least an hour the close attention of over 1000 visitors, was the gas cooking demonstration under the direction of that least erratic of cookers, Mrs. Rorer. It is not our purpose now to attempt a critical review of the exhibition, but merely to say that its arrangement and opening were successful in every sense, considering to the full that its managers were pioneers in the task they had undertaken. The attendance on the opening night was as representative of the gas industry as it was indicative of the interest in gas and its uses on the part of the public, since the gas president and gas superintendent counted for naught in their elbowings by the gas consumer, who was here, there, and everywhere on the aisles and other open spaces of the Garden's floor and boxes. Take it all in all, the exhibition is well worthy of the vast interest that it seeks to represent."

South Staffordshire Water-Works Company's Extensions.—For many months, complaint has been made in the Dudley Town Council of the intermittent nature of the water supply in some parts of Woodside and Hart's Hill; but an appeal to the South Staffordshire Water Company has resulted in provision being made which will ensure the inhabitants not only of the Woodside district, but of Brierley Hill, Quarry Bank, and Cradley Heath against shortness of water until their needs are much greater than at present. The necessary works (which are now in course of construction) will cost nearly £14,000; and they include arrangements for the storage of upwards of 3 million gallons of water.

ELECTRIC LIGHTING NOTES.

That the ratepayers of Walworth and Newington should have had the temerity to lodge petitions against the proposed granting of the Electric Lighting Provisional Order has so enraged the Progressive majority of the Newington Vestry, that they have forwarded to the Board of Trade a further report, in which they profess to reply to the objections made by their opponents. This report is too long to quote; but it practically impugns the veracity of several of the statements adduced, and reiterates the opinion that the scheme "is not likely to throw any burden on the parishioners." This report was approved by the Vestry by 38 votes to 11, after what may be truthfully described as an exhilarating discussion.

The Electric Lighting Sub-Committee of the Gas Committee of the Manchester Corporation have recommended, and the Council have agreed to, an application to the Local Government Board for sanction to the borrowing of a further sum of £130,000 for the purpose of the electric light undertaking. The proposal was introduced at the last meeting of the Council by Alderman Gibson, whose speech in support was directed to showing that the large amount of money which the Committee had already spent had been laid out wisely and well. He said that of the sum now asked for, £65,000 was required for engines, dynamos, and some structural alterations, and £50,000 for the extension of mains. In 1892 the Committee borrowed £80,000; and in 1893, £70,000, which enabled them to produce electrical energy quite sufficient for 40,000 8-candle power lamps. This they considered would probably be as much as would be required for the next three years; but the demand for the electric light still continued to increase rapidly. In 1895, the Committee borrowed £100,000, which was expended in further extension of the electric light. Still this was not sufficient; and in 1896, they were compelled to borrow £100,000. The result was that now they had producing power equal to 128,000 8-candle power lamps. They had connected with the system 136,000 lamps; so that the Committee were in the position that, if all the customers wanted the light simultaneously, there would be 8000 more lamps than the station could supply. They had also applications for 9956 extra lamps. It would therefore be seen that, while the Committee were travelling very fast, it was because they were being forced forward. In 1895, after paying interest and sinking fund and all working expenses, they made £5000 profit, and in 1896 £11,000. At the expiration of the present financial year, next month, it was extremely probable that the Electric Light Department would show quite as successful as last year. Concluding his speech, Alderman Gibson spoke emphatically as to the future of the electric light. He would, he said, be a bold man who would venture to foreshadow it as regarded Manchester. He believed there was no finality about it. The Council had undertaken to supply the whole of the city with electricity. There were looming in the distance and buzzing in the air all sorts of conditions to which they were going to apply electricity. The capital account of the department would have to be reckoned not by hundreds and thousands of pounds, but by millions. The undertaking would become as great as the gas undertaking, which at present was represented by millions of pounds. In his opinion, the time would come when the Electric Light Sub-Committee should become a Standing Committee of the Corporation. The recommendation, as already stated, was adopted.

The first complete year's working of the Walsall Corporation electric lighting department has resulted in a net deficiency of £445. The total expenditure (exclusive of interest and sinking fund) was £1130; and the income, £1568—leaving a surplus of £438 to be applied to interest and sinking fund, which together amount to £883.

Electric lighting had a good innings at the meeting of the Southport Town Council last Tuesday; some considerable discussion springing up round two proposals of the Electricity Committee. One was that the charge for current, as measured by the maximum demand meter should be as follows: For the first hour, 7d. per unit; second hour, 4d.; third and following hours, 2d. The other recommendation was that the Corporation should undertake to trim private arc lamps on certain specified terms. A great deal of explanation was needed by members in regard to the suggested adoption of the "Brighton" system of charging; and the second proposal called forth much opposition and argument from the usual competition-with-tradesmen point of view. However, the minutes were confirmed.

From the particulars furnished to the shareholders at the meeting of the Newcastle and District Electric Lighting Company last Tuesday, we learn that they have now 28,200 10-candle power lamps connected with their system; and during last year, 541,139 units of electrical energy were supplied, as against 471,600 in 1895. The gross earnings of the year amounted to £4771; and after paying interest and making provision for depreciation, sufficient remained to pay a dividend of 4½ per cent. for the past six months, making a total distribution of 7 per cent. for the year. The Newcastle Electric Supply Company also report that the current sold last year amounts to nearly 90,000 units in excess of 1895. They are in a position to pay a dividend of 5 per cent.; and, in order to meet the growing business, it has been resolved to increase the capital from £50,000 to £100,000.

On the evening of last Saturday week, the Mayoress of Cheltenham (Mrs. Rogers) switched on the current to the arc lamps which have been placed in the High Street, Clarence Street, and St. George's Place, as a first instalment of the public lighting of the borough by electricity. The ceremony took place in the Council Chamber; Alderman Norman (the Chairman of the Lighting Committee) presiding. In inviting the Mayoress to switch on the current, Mr. Norman remarked that this act would be an important one, not only because it would inaugurate improved public lighting in the town, but also because it would be the initiation of street lighting as the work of the municipality—such lighting having hitherto been done entirely through the Gas Company. Having referred to the growing demand for the electric light in the town, he observed that the first completed year of working would, he expected, pay all the working expenses of the undertaking; and next year he quite anticipated they would be able to pay, in addition to working expenses, the annual instalment of interest and capital repayment of the loans taken up. The 29 arc lamps which had been erected would displace 75 gas-lamps, of which 25 were of the "Guildhall" pattern and 50 ordinary ones. The Mayoress, amid cheers, pressed a button, and the new illuminant was immediately seen in the street. At the same time, a

400-candle power lamp was turned on in the Council Chamber. The proceedings ended by the company drinking (in champagne) success to the movement.

The Middlesex County Council have resolved upon lighting by electricity the new annexe for idiots and imbeciles, together with portions of the present asylum, at Wandsworth. The question, it is stated, arose partly owing to the large annual expenditure for painting and redecorating the wards caused by the use of gas, and to hygienic considerations. The consumption of gas in the asylum amounts to 7,648,200 cubic feet, costing £892 5s., which would have been largely increased had gas been the illuminant in the new annexe. The Committee obtained reports on the question from various sources, which, of course, were all favourable to electric lighting. The reporters held that the expense of producing the electric current need not exceed 2d. per unit, which they calculated as being equal to 1s. 6d. per 1000 cubic feet of gas, whereas now 2s. 4d. is paid. The estimated cost of the work necessary to provide 1500 electric lamps was placed at £5000. When the subject was before the Council, a suggestion was made that incandescent gas lighting should be adopted; but the Chairman of the Asylum Committee (Mr. Williams) said a trial of the light had been made, but it could not be used in an asylum to the extent desirable.

THE LONDON COUNTY COUNCIL AND THE WATER QUESTION.

The Council and the Outside Authorities—Opposition to Water Bills.

At the Meeting of the London County Council last Tuesday—Sir A. Arnold in the chair—a long report on the Water Purchase Bills, and on the agreements entered into with outside Local Authorities in connection therewith, was presented by the Parliamentary Committee.

Dealing first with the agreement come to with Surrey and Croydon, the Committee stated that all the outside authorities regarded it as a matter of the greatest importance that they should secure the right of claiming independent control of the water supply in their own areas before the passing of the Council's Bills; and their attitude to these Bills would depend upon whether the Council continued to recognize the justice of this claim. The Council had repeatedly admitted the reasonableness of it; and it was asserted in the resolution of Nov. 10, 1896, under which the Committee had carried on the negotiations. The Committee then, in accordance with the resolution passed at the previous meeting of the Council, proceeded to report on the result of their negotiations with other authorities. With regard to Kent, they stated that the various Local Authorities had arranged, in combination and by agreement, a scheme for the administration of the water supply of their respective areas. The arrangements entered into by the Committee with the representatives of the various authorities concerned were recommended to the Council for adoption, in this and in the other cases, on the broad general principle that the water supply of London, as of other large communities, should be administered by the elected local authority. The Council's claim to this right for London was the foundation of the Bills; and a similar right should, in the Committee's opinion, also be conceded to the local authorities of the adjacent area. The agreement with respect to Essex and West Ham follows the lines of that of Surrey. With regard to Middlesex, the Committee said the main point in their case was summed up by one of their principal witnesses in 1895, when giving evidence in relation to the Lambeth Water Bill, as follows: "I was going to show broadly that all the water undertakings are much more profitable within the area of London than they are outside London, and that consequently, if the London County Council buy up the Water Companies, and then sell to us the portion which is in our district, we shall practically have to pay through the nose for the portion which we have left to us, because the portion left to us will be the most unprofitable part of the undertaking." The Committee thought it was clear that Middlesex would not assent to any scheme under which the water supply of the whole Metropolitan area should be entrusted to a Board on which each district would be represented; but they considered any difficulty in regard to the present proposals would not be found insuperable "if approached on both sides from a purely business point of view." With respect to Hertfordshire, the other county concerned, their case differs widely from the others; the question being not one of supply, but of power to take water. Hertfordshire is not dependent for its supply on the London Water Companies. The Committee remarked that, whatever form of authority might be devised to settle the London Water Question, it had long been obvious that the question of Hertfordshire would have to be settled by Parliament. The people of London and Middlesex had rights by Charter and Statute to derive water from the county; but it was sought to limit that right. The Committee remarked that the only basis of negotiation seemed to be the admission by Hertfordshire that if the London County Council were asked to surrender any part of the rights of the people of London, it could only be on condition that Hertfordshire should assist in getting elsewhere other water in substitution, and should offer a fair price for the water rights it seeks to obtain. This had more than once been suggested, on behalf of the Council, to those who were conducting the Hertfordshire case. The report concluded as follows: "The negotiations with the other authorities have been necessarily delayed, because of the doubt which has recently arisen as to whether the Council might not reverse the main policy embodied in its previous resolution. It is clearly of the first importance that the Council should decide the matter without delay. The scheme which we present means united and concerted action between London and nearly all the local authorities concerned, and would practically leave little else to be adjusted under the Bills but the terms of the arbitration clause to regulate the purchase of the Companies' undertakings. It is reasonable to expect that the House of Commons would, in these circumstances, grant a second reading to the Bills; and we feel that we should be justified in expecting the Government to secure a reference of the scheme to a Select Committee, where, of course, it will have to be thoroughly investigated and justified; for the agreements which we ask the Council to seal can only be made operative by the approval of Parliament. The rejection of the agreements would mean that the Council would be brought face to face with vigorous and united opposition from the whole of the Metropolitan counties and water area, as well as from the Companies; and if the Council again defers a decision, the Bills could only proceed to a second reading with all the disadvantages which will be due to the doubt and distrust which will have been created as to the ultimate policy of the Council." The Committee recommended that petitions should be presented against the East London Water Company's Bill, as well as against the Bills promoted by the New River Company and the Kent Water Board—against the last-named Bill "in order that the Council may be in a position to make arrangements with the promoters."

Mr. T. M'Kinnon Wood, the Chairman of the Parliamentary Committee, brought up their first recommendation, as follows: "That the agreement with the County Council of Surrey be approved and sealed, and that, subject to the approval of Parliament, such clauses as may be necessary to give effect thereto be inserted in the Bills relating to the Lambeth and Southwark and Vauxhall Water Companies; that the clause arranged with the Corporation of Croydon be approved, and, subject to the approval of Parliament, be inserted in the Bill relating to the Lambeth Company." In moving its adoption, he said he had had a letter from the Surrey County Council in which that body urged the Council to come to a decision at once, and either accept or reject the agreement. It was important that the Council should recognize the just claims of the outside authorities. If they failed to do that, it would be fatal to the policy of purchase; and he assumed that a majority of the Council were certainly in favour of purchase. The outside authorities would oppose the Bills if these claims were not recognized; and it would be impossible for the Council to carry their Bills through Parliament with the combined opposition of the Home Counties and the Water Companies.

Sir J. Lubbock, Bart., M.P., said he objected to the agreement—first, because it broke up the present water area; and, secondly, because the arrangement gave Surrey until two years after the arbitration to decide whether or not they would join in the purchase. If the bargain turned out to be a good one, Surrey was to have the advantage; if it was a bad one, London was to bear the burden. He moved, as an amendment—"That it is undesirable to break up the water area until after the fullest inquiry; and, further, that, in the opinion of the Council, it is not just to the ratepayers of London that the outside areas should have the option of determining whether they would join in the purchase of the undertakings of the Water Companies after the price had been fixed; and it would be equitable that they should be bound by the results of the arbitration in the same manner as the County of London."

Lord Onslow seconded the amendment. He said the negotiations which had been carried on had grossly neglected the interests of London. It seemed really to be something like putting up the Bills to a Dutch auction. If, instead of taking all these extreme pains to satisfy the outside area, a little trouble had been expended to satisfy the Government and those who acted with them, the Committee would have done good service. The outside areas were to support the Bills in Parliament; but was there any other compact of a secret nature? The House of Commons was the tribunal to which these matters had to be referred; and he was glad the House had an opportunity of seeing in all their nakedness the ideas of spoliation of the ratepayers of London which was proposed by the Progressive party in the Council.

Mr. Sidney Webb claimed that the most valuable area was that in London; and even the Water Companies themselves regarded the outside areas as being only of secondary importance.

The Deputy-Chairman (Mr. R. M. Beachcroft) said the proposals before the Council more than justified Dr. White's amendment of last week. It was now abundantly clear that the consumers of water in London were to be sacrificed, in order that the majority of the County Councils outside might be induced to support the second reading of the Purchase Bills. They were told that in 1895 great progress had been made with the negotiations with the outside bodies, and that now the scheme represented by the proposals before them meant united and concerted action between London and nearly all the local authorities concerned. Necessity never made a good bargain; and necessity had led Mr. Wood and Mr. Dickinson to make or suggest bargains which could not be described as good for London. There never was such a case presented to the representatives of 4½ millions of people to justify acceptance of the principle that the sources of water on which they depended should be shared with five other rival bodies. He had hoped the Government would see their way to send the Purchase Bills to a Committee. But he now doubted if this would be in the interests of the London consumers; for if the County Councils of London and the outside areas were willing to play a game of scramble over the carcase of the Water Companies, there might be no one left to argue the case effectively before the Committee, and the result might be worse than if the Companies were allowed to drag on their weary and trammelled existence.

Dr. White pointed out that by these agreements the Council were buying the right not only to supply London, but the profitable and rapidly-growing areas outside. The Council would have to pay the full price for that right; but here it was proposed to bribe the outside authorities by bartering away the right beforehand for an inadequate price.

Mr. M'Kinnon Wood replied, and asserted that the present proposal entirely followed precedent, and was one which the Council could thoroughly support before a Parliamentary Committee.

A division was taken, when there voted for the amendment, 47; against, 57—majority, 10. The recommendation was then agreed to.

The Committee next recommended the Council to adopt certain heads of arrangement with the Kent authorities, and to authorize arrangements being made for the settlement of a formal agreement. This recommendation was, however, withdrawn, as the negotiations are not yet complete; and the matter will be further considered.

On the recommendation that the Council should accept certain heads of settlement between the County Councils of London, Essex, and West Ham, a division was taken; and it was agreed to by a majority of 11.

On the recommendation to petition against the Bill of the East London Water Company,

Mr. Pearce suggested that direct opposition would do more harm than good to the people of the East-end; and he moved, as an amendment, that the Parliamentary Committee should endeavour to obtain an alteration of the Bill, so that the extra charges for high service of the Company could be abolished, and the Company be compelled to contribute to the expenses of the Lea Conservancy.

Mr. Idris seconded the amendment; and it was agreed to unanimously.

It was next resolved to petition against the New River Company's Bill.

SHEFFIELD CORPORATION WATER SUPPLY.

The Question of the Engineering of the Little Don Works Still Unsettled—The Leakage at the Damflask Reservoir Stopped.

Last Wednesday, to use the words of the "Sheffield Independent," the Sheffield City Council "got entangled in another futile and undignified discussion respecting the appointment of an engineer to construct the proposed Langsett reservoir." A minute of the Water Committee was to the effect that Mr. William Watts, the Water Engineer of the Oldham Corporation, be appointed Resident Engineer for the Little Don Valley new water-works at a fixed salary of £1200 per annum. To this Mr. Lancashire proposed an amendment, suggesting that the appointment be not confirmed, but that the salary be £800. Alderman Gainsford pointed out that the motion of the Committee was part of the scheme agreed upon by the Council, and submitted that the amendment was therefore out of order. The Mayor (the Duke of Norfolk), however, ruled that an amendment to the effect that the minute be not confirmed would be in order; and while the subject was being considered in its technical phases, Mr. Hughes rose to call attention to the situation in which the Council were placed. Speaking with some warmth, he reviewed the whole question, and sought to show that the Council had already been proved wrong in refusing the original scheme of the Committee. He dealt at some length with the testimonials and credentials of Mr. Watts, with a view of showing that he was obtaining an undue increase in his salary and position. Mr. Hughes put the salary at present received by Mr. Watts at £400 a year. This was afterwards stated to be £450; and it also came out that Mr. Watts had certain other benefits, such as a free house, horses, groom, and gardener, and the right to engage in private practice. After Mr. Hughes sat down, Mr. Lancashire formally moved an amendment that the portion of the proceedings relating to the appointment of Mr. Watts be not confirmed. This was seconded by Mr. Chapman; and then began a discussion which was decidedly lively, and at times very much involved. Mr. George Senior at the outset remarked that the whole thing had better be sent back to the Committee. Alderman Gainsford pleaded that what the Committee had done had been at the instruction of the Council; and if they were now in an unsatisfactory position, the fault lay with the Council, and not with the Committee. Mr. Bennett denied that the action of the Council in refusing the earlier proposals of the Water Committee had landed them in a difficulty. Alderman Brittain contended that Mr. Watts had more experience of the class of work for which he was required than had Mr. Eaton. Mr. Styring also urged this point, and remarked that Mr. Watts had practically devoted his life to work like that upon which he would be engaged at Sheffield; and in support of this, it was mentioned that Mr. Watts had carried out the work connected with the construction of thirteen reservoirs, and also designed others. Alderman Skelton maintained that the salary and other benefits at present received by Mr. Watts at Oldham really represented £700 a year; so that it was not a big advance that they were offering him. Sir Henry Stephenson appealed to the Council not to repudiate their bargain after advertising a certain sum, and thus take a course which, he said, no honourable private firm would adopt. The gentlemen who favoured a reduction contended that a good man could be obtained for £800; and it was therefore the duty of the Council to adopt that as the salary. Eventually the vote was taken, with the result that 36 voted for the amendment, 11 against, and 7 were neutral. From this point, matters became very complicated. There were several amendments, including one by Mr. G. Senior that the whole matter be sent back to the Water Committee, which was, however, lost. It was held by the Mayor that the minute of the Committee having now been disapproved, the Council might consider further amendments; and thus the proposal to make the salary £800, rising by £50 increases annually to £1000, again came up. Some members were willing to offer Mr. Watts the alternative of accepting the post on these terms. Others preferred to advertise the post afresh with these conditions; but eventually it was decided for the Council to advertise for a constructive and designing engineer without stating salary—leaving it open for the applicants to name their terms.

The leakage at the Damflask reservoir has at last been stopped; and Messrs. C. Hawksley and E. M. Eaton have reported to the Water Committee that the filling of the reservoir has been safely accomplished, and that it is now available to its full capacity for use in connection with the general purposes of the water undertaking.

The Recent Gas Explosion at Norwich.—Mrs. Eliza Buttwell, aged 70, the aunt of John Leverett, occupier of the house in Palace Street, Norwich, where the disastrous gas explosion took place on the 3rd inst., died on Thursday morning. As stated last week, the deceased would not leave the house on the night of the 2nd inst., when an overpowering smell of gas was detected; and next morning, when Leverett called at the house to see her, he discovered her lying in an unconscious state at the bottom of the stairs, with a wound in her temple.

The Gravesend Water-Works Purchase Question.—The poll on the question of Northfleet joining with Gravesend in a scheme for the compulsory acquisition of the Gravesend and Milton Water Company's undertaking was taken on the 3rd inst.; the affirmative majority being only two votes. The Higham and Hundred of Hoo Water Company are threatening to oppose the Bill; and the promoters have therefore determined that section 4 of the Joint Water Board Bill and of the Gravesend Corporation Water Bill shall be modified so as only to provide for the inclusion of the parish of Chalk within the limits of supply named in the Bills, on the failure of the Higham and Hundred of Hoo Water Company to commence operations therein before the end of the present century. The promoters have also, in deference to the suggestions made by the Secretary of the Kent Water Company, resolved that a proviso shall be added to section 49 of the Joint Water Board Bill and to section 32 of the Gravesend Corporation Water Bill, prohibiting the sale of water in bulk within the district of any water company without the consent of such company. A poll of the Gravesend ratepayers was taken last Thursday respecting the proposed purchase, and resulted in a majority of 242 against the proposal. The figures were: For the purchase, 1635; against, 1877.

THE TERMS OF PURCHASE OF MUNICIPAL WATER UNDERTAKINGS.

At the Meeting of the London County Council on Oct. 13 last year, it was referred to the Water Committee to prepare and present to the Council a report showing generally the terms upon which water undertakings have been purchased by Provincial Local Authorities; specifying whether the transfer was by agreement or as the result of arbitration, and if the latter, whether or not the basis was that of the Lands Clauses Consolidation Acts. The object of the reference was evidently to obtain particulars to guide the Council in their dealings with the London Water Companies, should they ever be armed with authority to negotiate for the acquisition of their property. The Committee, in entering upon the task assigned to them, deemed it best to limit their report to the cases of the county boroughs; these being the most important, and the information being more readily available than that relating to the smaller boroughs. As the result of their inquiries, they found that, out of the 64 county boroughs in England and Wales, 43 have the water supply in their own hands; while one (Middlesbrough) is supplied, together with the municipal borough of Stockton, by a Joint Water Board. In 12 of the 44 cases, the water-works were originally constructed by the Corporations; in the remaining 32, they were purchased from Companies. This leaves 20 county boroughs without a municipal water undertaking; but one (Bootle) receives its supply from the Liverpool Corporation. Of the 32 cases of purchase, 23 were the outcome of agreements entered into, and subsequently embodied in, or confirmed by, Acts of Parliament. With regard to the remainder, four undertakings were purchased by agreement in virtue of Acts in which it was provided that, failing agreement, there was to be arbitration under the Lands Clauses Consolidation Acts; two, by arbitration under those Acts; one, by arbitration under special terms; and two (Manchester and St. Helens) were transferred by agreement after the passing of an Act authorizing purchase. As, besides the county boroughs, there are in England and Wales 240 municipal boroughs, including the City of London, the Committee felt that it would not be easy to find out exactly what had happened in regard to the water supply in all these cases. So far as information was obtainable, they ascertained that the supply is in the hands of the Corporations in 117 of the boroughs, that seven are served by Joint Water Boards or Committees, and that one obtains its water from a neighbouring Corporation. In the great majority of cases, the works were originally constructed by the local authorities; but in 25 boroughs they were taken over. The results of the Committee's investigations have been tabulated in the Statistical Department of the Council, under the supervision of its chief (Mr. G. L. Gomme); and from them we take the particulars given below.

The following table contains a list of the county boroughs in which the water-works have been purchased, together with the date of the Act authorizing the transfer, and, with three exceptions, that on which it took place. In the succeeding remarks, the conditions and terms of the acquisition in each case are briefly set forth.

Name of County Borough.	Company whose Undertaking was Purchased.	Date of Act Authorizing Purchase.	Date of Transfer of Undertaking.
Barrow-in-Furness	Furness Gas and Water Co.	July 13, 1868	Jan. 1, 1868
Birkenhead	Birkenhead and Claughton Gas and Water Co.	July 23, 1858	Mar. 31, 1858
Birmingham	Birmingham Water Co.	Aug. 2, 1875	Jan. 1, 1876
Blackburn	Blackburn Water Co.	July 19, 1875	July 1, 1875
Bolton	Bolton Water Co.	June 8, 1847	Sept. 29, 1847
Bradford	Bradford Water Co.	July 3, 1854	Jan. 1, 1855
Brighton	Brighton, Hove, and Preston Gas and Water Co.	July 18, 1872	July 1, 1872
Burnley	Burnley Water Co.	June 2, 1846	Sept. 24, 1846
Bury	Bury Water Co.	July 25, 1872	July 1, 1872
	Haslingden Water Co.		Jan. 1, 1873
Cardiff	Cardiff Water Co.	July 21, 1879	Dec. 24, 1879
Derby	Derby Water Co.	Aug. 11, 1879	Jan. 1, 1880
Exeter	Exeter Water Co.	July 22, 1878	Mar. 25, 1878
	Dartmoor and Exeter Water Co., Limited		
Gloucester	Gloucester Water Co.	June 26, 1855	June 26, 1855
Ipswich	Ipswich Water Co.	June 20, 1892	Sept. 29, 1892
Leeds	Leeds Water Co.	June 17, 1852	Nov. 17, 1852
Leicester	Leicester Water Co.	July 4, 1878	June 30, 1878
Lincoln	Lincoln Water Co.	July 24, 1871	Sept. 29, 1871
Liverpool	Liverpool Water Co.	July 22, 1847	Mar. 31, 1848
	Liverpool and Harrington Water Co.		
	Chorley Water Co.	April 29, 1856	Sept. 29, 1855
Manchester	Manchester and Salford Water Co.	July 9, 1847	Jan. 1, 1851
		July 24, 1851	
Middlesbrough	Stockton, Middlesbro', and Yarm Water Co.	Aug. 11, 1876	July —, 1878
Newport	Newport Water Co.	July 5, 1888	June 30, 1888
Northampton	Northampton Water Co.	July 28, 1881	June 24, 1884
Nottingham	Nottingham Water Co.	Aug. 11, 1879	Mar. 26, 1880
Oldham	Oldham Gaslight and Water Co.	June 14, 1853	Aug. 1, 1853
Preston	Preston Water Co.	June 14, 1853	1854
Reading	Reading Water Co.	July 13, 1868	Sept. 29, 1867
Rochdale	Rochdale Water Co.	June 28, 1866	Oct. 1, 1866
St. Helens	St. Helens Water Co	Aug. 7, 1851	1851
Salford	Manchester and Salford Water Co. (part)	July 29, 1850	Jan. 1, 1851
Sheffield	Sheffield Water Co.	July 29, 1887	Jan. 1, 1888
Wigan	Wigan Water Co.	June 28, 1853	(before 1860)
Wolverhampton	Wolverhampton Water Co.	July 15, 1867	Jan. 1, 1868

REMARKS.

Barrow-in-Furness.—An agreement, dated Dec. 16, 1857, was entered into between the Furness Gas and Water Company and the Corporation

for the sale and the transfer of the Company's undertaking. This agreement was embodied in an Act, which provided that, if the purchase was not completed and the money paid on or before Jan. 1, 1870, the Company might cancel the arrangement. The purchase was, however, effected; the price being fixed at £82,500.

Birkenhead.—The preamble of the Act under which the water-works were acquired set forth that it was expedient that the Improvement Commissioners should be authorized to construct new works, and that provisions should be made for transferring the existing ones to them. It was therefore enacted that the Birkenhead and Claughton Gas and Water Company should sell, and the Commissioners purchase, the whole of the undertaking, as from March 31, 1858, for the sum of £220,000.

Birmingham.—By the Birmingham Improvement Act, 1851, it was enacted that the Town Council might, after twelve months' notice, purchase the whole of the works of the Birmingham Water Company, upon such terms as should be agreed between the Council and the Company: and in case the Company should not agree as to the price to be paid, then it was to be settled under the Lands Clauses Consolidation Act, 1845. From the date of the purchase, all the powers of the Company were to be exercised by the Council. As, however, it was thought that doubts might be entertained whether the power of purchase thus conferred on the Corporation was exercisable when the Corporation desired to possess the works in 1875, an Act was obtained which specified that, at any time within three years after its date, the Corporation might require the Company to sell their undertaking, on such terms as they and the Corporation should agree, or, in default of agreement, as should be settled by arbitration, in the manner provided by the Lands Clauses Act.

Blackburn.—The agreement for the transfer of the Blackburn Water-Works was dated May 26, 1875; and it was embodied in an Act of the same year. The consideration for the sale was to be annuities to be granted to the Blackburn Water Company, as follows: In respect of the sum of £119,285 10s. of ordinary stock, perpetual annuities calculated for the five years ending June 30, 1880, at the rate of 9 per cent. per annum, and thenceforward in perpetuity at the rate of 9½ per cent. per annum; and in respect of the 5000 perference shares of the Company, perpetual annuities of 4½ per cent. per annum on the amount paid up on calls or in advance of calls.

Bolton.—By an Act dated June 8, 1847, the Bolton Corporation were authorized to take a lease of, and to purchase, the works of the Bolton Water Company. It was provided that the lease was to be approved by the Commissioners of Her Majesty's Treasury, and be executed within three months after the passing of the Act. The terms of the lease were to substantially comply with the following provisions: (1) The term created was to be fifty years. (2) There was not to be any fine paid for the lease. (3) The rents were not to exceed the yearly sum of £4500. . . (6) Lessees were to be bound to pay all the interest on the mortgage debts of the lessors, not exceeding the aggregate principal sum of £29,900, as should accrue during the term. (7) The lessees were to be bound to pay all rents, rates, taxes, and other charges.

Bradford.—By an agreement, dated March 13, 1854, made between the Bradford Corporation and the Bradford Water Company, and confirmed by Act of Parliament, the Company sold, and the Corporation bought, all the property, powers, and privileges which on Dec. 31, 1854, vested in the Company; the consideration for the purchase being £165,000 and a mortgage debt of £6000.

Brighton.—The water-works of the Brighton, Hove, and Preston Gas and Water Company were transferred to the Brighton Corporation under an agreement confirmed by an Act of 1872. The consideration was a sum of £321,156 11s. 8d. net, whereof £199,000 was the price of the lands, buildings, and other real estate. The mortgage debt of the Company, amounting to £27,000, passed over to the Corporation.

Burnley.—The Burnley Water Company having expressed their willingness to sell their undertaking to the Improvement Commissioners of Burnley for the sum of £10,500, subject to two mortgages of £500 each, at 4 per cent., and to certain ground rents for the reservoirs and land adjacent of £12 12s. and £21, this arrangement was sanctioned by an Act passed on June 2, 1846.

Bury.—In this case, the works of two Companies were purchased by authority of an Act passed on July 25, 1872. It provided that, as from the 1st of July in that year, the undertaking of the Bury Water Company was vested in the Improvement Commissioners, who were to deliver to the shareholders perpetual annuities as follows: As regards the 1333 £15 preference shares, a perpetual annuity of £1 10s. in respect of each share; as regards the 1333 £18 preference shares, a perpetual annuity of 14s. 4¾d. "and ¾ of a farthing" in respect of each share; as regards the 4000 new £10 preference shares, and the 5000 £10 ordinary shares, an annuity in respect of each share on the following ascending scale: 17s. for the year ending June 30, 1872; 18s. for the year ending June 30, 1873; 19s. per annum for the 18 months ending Dec. 31, 1874; and thenceforward £1 per annum for ever. With respect to the 1000 new £10 shares (1870), there was to be paid an annuity on the following ascending scale: £2 per cent. per annum on the amount actually paid up on each share up to and including the 30th of June, 1875; 4s. 8d. (being at the rate of 9s. 4d. per annum) for the half year ending Dec. 31, 1875; and thenceforward £1 per annum for ever. The mortgage debt of the Bury Company was to be a first charge upon the undertaking. As from Jan. 1, 1873, the undertaking of the Haslingden Water Company was vested in the Commissoners, who were to deliver to the shareholders perpetual annuities as follows: As regards the 4364 £10 preference shares, an annuity of 6s. per annum for the five years ending Dec. 31, 1877, and thenceforward 12s. per annum for ever; as regards the 2249 £10 ordinary shares, to the owner an annuity in respect of each share on a scale commencing at 1s. for the year ending Dec. 31, 1878, rising to 7s. 6d. for the year ending Dec. 31, 1891, and thenceforward 8s. per annum for ever; and in respect of the sum of £29,764 annuities on a scale commencing for the year ending Dec. 31, 1878, after the rate of ½ per cent. per annum, rising for the year ending Dec. 31, 1888, after the rate of 3 per cent. per annum, and thenceforward 3 per cent. per annum in perpetuity. The mortgage debt of the Company was, as in the case of Bury, to be a first charge upon the undertaking.

Cardiff.—The Cardiff Water Company agreed to sell their undertaking to the Corporation for the sum of £300,000. But the whole or any part of the purchase-money might, by agreement with the Company, be commuted for annuities or stock; and any such commutation was to be after the rate of £4 per annum for every £100 commuted. The mortgage debt of the Company was to be a first charge upon the water revenue.

Derby.—The consideration for the transfer of the Derby Water Company's undertaking to the Corporation was the payment by the latter of the sum of £308,000, and the taking over of the debenture debt amounting to £43,300. Every question of difference that might arise between the Corporation and the Company as to the construction or meaning of the provisions contained in the Act sanctioning the purchase was to be referred to the decision of three arbitrators, one of whom was to be appointed by the Company, one by the Corporation, and the third by the two arbitrators. All the provisions of the Common Law Procedure Act, 1854, with respect to arbitration and awards, were to apply to any arbitration.

Exeter.—In this case, two Companies—the Exeter Water Company and the Dartmoor and Exeter Water Company, Limited—were concerned. The Limited Company, which really only existed on paper, had a Bill in Parliament in 1878; but they agreed to withdraw it on payment to the promoters of a sum not exceeding £2000. By an Act of July 22, 1878, the works of the existing Company were to be transferred to the Corporation for such consideration by way of annuities and other payment, and generally upon such terms and conditions, as were specified therein. The stock in hand and the moveable plant were to be taken over at the price of £997 18s. 6d. The mortgage debt of the Company was to remain a first charge on the revenue; and the Corporation were to issue to the shareholders perpetual annuities of the amount of £2 in respect of each share.

Gloucester.—A contract was entered into in 1854 between the Gloucester Water Company and the Local Board for the purchase by the latter of the Company's undertaking, on terms to be settled by arbitration. By an indenture dated the 3rd of June in the following year, an award made under an arbitration which had been held was agreed to between the parties; and by an Act passed on June 26, 1855, the Company's property was acquired by the Corporation for the amount specified—£18,500.

Ipswich.—The undertaking of the Ipswich Water Company, was transferred to the Corporation by agreement, confirmed by an Act passed in 1892; the consideration being the payment of the sum of £200,000. On the completion of the purchase, the Corporation took over and paid for, according to a valuation, all the stock of the Company, as well as the coals, meters, and stores. All differences between the parties were to be settled by arbitration, under the Arbitration Act, 1889.

Leeds.—For the undertaking of the Leeds Water Company, the Corporation agreed to pay a sum equal to the aggregate amount of the Company's capital actually paid up at the time of the transfer, and such other sum as, in addition to the amount theretofore paid by way of dividends or interest on that capital, would be equal to interest at the rate of 6 per cent. thereon from the time when the same was last paid to the time of the transfer.

Leicester.—Under Acts passed in 1851 and 1866 respectively, the Corporation of Leicester were entitled to half the yearly surplus profits of the Leicester Water Company after payment of the interest on their statutory loans and a dividend of 4½ per cent. per annum on the "A" shares, and of 5 per cent. per annum on the "B" shares. The dividend was limited to 10 per cent. on those shares, and to 7 per cent. on the ordinary shares. Under the provisions of various Acts, the Corporation were, in 1878, shareholders in the capital of the Company to the following extent: "A" shares, £17,000; "B" shares, £25,500; and new ordinary shares, £6050. The Corporation then agreed with the Company for the transfer of their undertaking; the consideration being the payment to the shareholders, in respect of each £25 share, of £43 15s., by the issue of an equivalent amount of debenture stock. The mortgage debts of the Company became a first charge upon the water revenue of the Corporation.

Lincoln.—By virtue of an agreement entered into between the Lincoln Water Company and the Corporation, and subsequently confirmed by Act of Parliament, the works of the Company were transferred to the Local Board of Health; the purchase price being fixed, and questions of disputed compensation settled, by arbitration under the Lands Clauses Consolidation Act, 1845. It was specified in the confirming Act that, in ascertaining the price to be paid, the Local Board should not be entitled to claim any reduction or abatement by reason of any irregularity or excess of power in the construction or use by the Company of their works. The Board might deduct the bond debt of the Company, stated to amount to £6000; and in that case they were to take upon themselves the obligation of satisfying the debt.

Liverpool.—The original water supply of Liverpool was furnished by the works of the Liverpool and Liverpool and Harrington Water Companies. By an Act of the latter Company, passed in 1846, they were authorized, within twelve months, to sell their works to the Corporation, for such price as should be mutually agreed upon, or be determined by arbitration under the Lands Clauses Consolidation Act, 1845; and the Liverpool Company were similarly empowered to dispose of their undertaking. In an Act of the following year the Corporation were required to purchase the works of both Companies before supplying water for other than public purposes; and if the price to be paid for them was settled by arbitration, it was specified that all considerations of "actual or supposed depreciation by reason of the powers given by the Act" should be excluded by the arbitrators. The transfer took place on March 31, 1848. It was subsequently found that, owing to the works of the Corporation intersecting those of the Chorley Water Company, disputes and difficulties arose which could only be conclusively and satisfactorily terminated by placing both undertakings under the same management. Accordingly, an agreement was entered into on Nov. 16, 1855, for the transfer of the Company's works to the Corporation, subject to a mortgage debt amounting to £8000, in consideration of the payment of £10,000, with interest on part thereof, as therein provided. This sum having been paid, and mortgages issued to the amount of those granted by the Company, which were cancelled, authority was given, by an Act passed in the

following year, for the transfer of the undertaking to the Corporation; the consideration being the payment by them, for a period of two years from March 29, 1856, of an annuity of £1020, and thereafter perpetual annuities to the same aggregate amount.

Manchester.—The Manchester and Salford Water Company agreed, under the provisions of an Act in force, to sell to the Corporation their works as they stood on Jan. 1, 1851, in consideration of the annual payment of £3 per annum from that day on each of the 6354 entire shares in the Company, and a sum after the rate of 5 per cent. per annum on the amount for the time being paid up on the 5589 half shares in the Company; but subject to power to the Corporation to buy off each or either of such annual payments at a price calculated at 20 years' purchase. The purchase of the works was completed, and the aggregate annual sum to be paid by the Corporation in respect of the whole shares was £19,062; and of the half shares, £3213 13s. 6d. The aggregate amount of the mortgages and bonds created by the Company, and charged on the borough rate, was about £100,000.

Middlesbrough.—The undertaking of the Stockton, Middlesbrough, and Yarm Water Company was transferred to the present Joint Water Board, formed of members of the Corporations of the first-named towns, in July, 1878. The consideration was to be either perpetual annuities amounting to £18,647 (the maximum statutory dividend of the Company), or a sum in gross calculated at 25 years' purchase of that sum. The Corporations were to take over and pay the statutory debt of the Company, and also pay them a sum for compulsory sale and for the prospective value of the undertaking. Any differences arising were to be settled by arbitration, in accordance with the provisions of the Lands Clauses Consolidation Acts, 1845, 1860, and 1869.

Newport.—The terms upon which the Newport Water Company agreed to sell their undertaking to the Corporation were as follows: The sum of £10,000 in cash; the issue to every holder of "A" or "B" stock of an annuity of £8 in respect of each £100 of such stock, and so on in proportion for any fraction of £100; to every holder of preference stock, of an annuity of £6 in respect of each £100 of such stock, and proportionately for any fraction of £100; and to every holder of a "C" share, of an annuity equal to 14s. in respect of each share. The Corporation were empowered, by agreement with any holder, to issue or grant to him debenture stock or other securities.

Northampton.—In an Act passed in 1882, provision was made that if, at any time within six years, the Northampton Corporation should give twelve months' notice requiring the Water Company to sell to them their undertaking, with the sanction of the Local Government Board, the Company should sell it for such consideration as should be mutually agreed upon, or, in default of agreement, as should be settled by arbitration under the Lands Clauses Consolidation Act, 1845. The notice was served; and the Company agreed for the sale of their undertaking. The principal consideration was the issue by the Corporation, to every holder of a share, of a debenture for securing to him the payment on June 24, 1944, of the principal sum of £25, with interest thereon in the meantime at the rate of 4 per cent. per annum, payable half yearly. The purchase of the undertaking was to take effect as from June 24, 1884. The mortgage debt of the Company, amounting to £4000, and the interest thereon, continued to be a first charge on the net revenue of the water undertaking.

Nottingham.—The Corporation of Nottingham took over the undertaking of the Nottingham Water Company as from March 26, 1880, in virtue of an Act passed in the preceding year. In this it was enacted that the Corporation should pay to the Company, on or before the date of the transfer, the sum of £10,000, in lieu of the Company themselves receiving and appropriating the water-rents due and remaining unpaid; and the Corporation were to be entitled to the cash balance and the reserve fund. In consideration for the purchase, the Corporation were to pay to the Company £20,000, and grant annuities for every fully paid-up share at the date of the transfer as follows: In respect of the year ending March 25, 1881, an annuity calculated at the rate of 6½ per cent. per annum for that year; for 1882, at the of 6¾ per cent. per annum; and for 1883, and every subsequent year, a perpetual annuity at the rate of 7 per cent. per annum. All debts (including the mortgage or bond debt of the Company), and all rents, rates, charges, and sums of money due or owing from the Company were to be paid by the Corporation after the purchase.

Oldham.—The Oldham Water-Works were transferred, in conjunction with the gas-works, from the Oldham Gas and Water Company to the Corporation on Aug. 1, 1853; the consideration being the payment to the shareholders of perpetual annuities of £1 for each £10 share held by them.

Preston.—A provisional agreement was entered into on Sept. 16, 1852, between the Preston Local Board and the Water Company, for the sale of the undertaking of the latter to the former; the amount of the purchase-money to be fixed by reference. It was specified that the purchase and compensation money was to be a sum in gross; and the Referee was to name the time for payment to be made and possession of the works to be given up. By an Act passed in the following year, this agreement was confirmed; but it was provided that the Board and the Directors of the Company were to be at liberty to enter into such other agreements in regard to the sale, purchase, and management of the undertaking as they might think proper.

Reading.—The undertaking of the Reading Water Company was transferred to the Local Board in 1867, together with a mortgage debt amounting to £14,000. The consideration for the transfer was the granting by the Board to the shareholders of the Company of a perpetual annuity of 14s. for each £10 share; the amount of the capital being £42,000.

Rochdale.—On Oct. 1, 1866, the Rochdale Water-Works were taken over by the Corporation in consideration of the payment to the shareholders of the Water Company of 1332 perpetual annuities of £4 4s. each, and of a like number of £1 8s. each.

St. Helens.—Under the provisions of 9 Vict., cap. 176, the Town Commissioners of St. Helens were empowered to make provision for the better supply of their district with water; and they entered into a contract with the St. Helens Water Company to lease their works for 5000 years from Dec. 25, 1850. This contract was carried into effect by an Act passed in the following year.

Salford.—In the Manchester Corporation Water-Works Act, 1847, it was enacted that in case the borough of Salford should at any time be authorized to purchase in bulk and to distribute water throughout the borough, the Corporation of Manchester were required to sell to Salford, at such price as should be agreed upon, or, in case of disagreement, be settled by arbitration under the Lands Clauses Consolidation Act, 1845, the whole of the works within the borough, and that all the water to be supplied to the borough by Manchester should be in bulk, at a price to be agreed upon, not exceeding 3d. per 1000 gallons. The Corporation of Manchester were agreeable to the transfer to Salford of the works above specified (being part of the undertaking of the Manchester and Salford Water Company); and they were also willing to supply to Salford, as from Jan. 1, 1851, certain quantities of water for specified annual payments. The consideration for the purchase of the works and the supply of water was as follows: From Jan. 1, 1851, to Jan. 1, 1856, an annual sum of £5562 10s.; from Jan. 1, 1856, to Jan. 1, 1858, an annual sum of £6000; and from the last-named date, an annual sum of £6500 in perpetuity.

Sheffield.—An agreement having been come to between the Sheffield Water Company and the Corporation for the sale of their undertaking, an Act was obtained in 1887 to authorize the transfer. The consideration was the issue by the Corporation to the holders of the 4 and 5 per cent. preference shares of annuities of equivalent value; and to the holders of ordinary shares, of annuities at certain specified rates for each £100 of capital. The scale commenced at £2 for the years 1888 and 1889, and rose to £4 for 1894 and every subsequent year. In this connection, reference may be made to a report made by the Water Committee of the Corporation in 1892, and given in the "JOURNAL," Vol. LX., p. 125. Each shareholder had the option of taking a fixed annuity, dating from Jan. 1, 1888, of £3 for every £100, or the sum of £82 payable in cash on Jan. 21, 1888, for every £100 of capital.

Wigan.—The undertaking of the Wigan Water Company was transferred to the Local Board of Health by an agreement dated Dec. 27, 1852, in which the manner of ascertaining the price to be paid therefor was specified.

Wolverhampton.—Under the Wolverhampton New Water-Works Act, 1855, the Wolverhampton Water Company were bound, if required to do so by the Corporation, to sell the whole of their undertaking. An agreement was subsequently entered into whereby the property became vested in the Corporation as from Jan. 1, 1868, in consideration of the payment of the following yearly rents: (1) The sum of £1085 15s. in respect of the Company's preference capital of £21,715, and also a sum equal to 5 per cent. upon any further preference stock that might be issued. (2) For the year commencing Jan. 1, 1868, the sum of £2500 in respect of the Company's ordinary share capital of £100,000; for the year 1869, a similar sum; for the year 1870, £3000; for the year 1871, £3500; and for the year 1872 and every subsequent year, £4000. As from Jan. 1, 1868, the Corporation became liable for the debenture debt of the Company, amounting to £40,000. The agreement was confirmed by an Act passed in 1867, which specified that the deed of grant and transfer should contain the usual arbitration clauses, which were to be settled by a gentleman named, or by someone to be nominated by the Board of Trade on the application of either party.

WATER SUPPLY OF LONDON AND OTHER LARGE TOWNS.

An Examination of Municipal Water Supplies.

In our article on "Water and Sanitary Affairs" on Jan. 26, reference was made to a communication which has lately appeared in "The Times," wherein a correspondent has compared the water supply of London with that of certain large towns in England. In view of the strong demand now being made for the municipalization of the Metropolitan Water Companies' undertakings, it may be of interest to reproduce his remarks.

Gigantic schemes for doing something to the London Water Supply are being dangled before the London ratepayers. They vary in scope, but they agree in aiming at some measure of public control; and they all rest upon the assumption that London is at present badly served in comparison with the large provincial towns which enjoy a municipal supply. The public have been informed that the London Water Companies provide a less copious, a dearer, a less pure, and a less regular supply, and impose more burdensome conditions than the municipal authorities. These assumptions have been repeated so often without contradiction, and have been so readily accepted by consumers, who cherish a natural dislike and suspicion of anyone to whom they pay rates, that it is no longer considered necessary even to state them. They are taken for granted, with the inevitable corollary that "something must be done." Now, whatever scheme is adopted, and whatever other results it may have, it will certainly cost a good deal of money, which must come out of the ratepayers' pockets. Before committing themselves, therefore, to any scheme, they will do well to examine the facts, and see how far the assumption on which the whole case rests is justified.

To compare London with all the large provincial towns in detail would occupy too much space. It will be fair, however, to take the four largest in England—viz., Manchester, Liverpool, Birmingham, and Leeds. They are favourable specimens for the purpose, on the whole; and the inclusion of a larger number would merely emphasize the same conclusion.

Quantity of Water Supplied.—During the first eight months of 1896, which is the latest period for which full returns are available, the average amount of water supplied daily per head of the population was as follows: Manchester, 25·8 gallons; Liverpool, 28·3 gallons; Birmingham, 24·1 gallons; Leeds, 34·9 gallons; London, 38·1 gallons. If the domestic consumption only be taken, the difference in favour of London is still greater, as the big manufacturing towns use a larger quantity per head for trade purposes. For instance, in Leeds, which comes nearest to London, the average domestic supply is 25·3 gallons, against 30 gallons in London. The following table gives the daily amount in gallons for each month, excluding fractions. It shows that the summer rise, which strains the resources of the Metropolitan Water

Companies, and is ascribed to their bad management, also affects the Provincial Water Authorities :—

Town.	Jan.	Feb.	March	April	May	June	July	Aug.
Manchester . .	24	25	24	24	26	27	28	26
Liverpool . . .	25	25	26	27	29	31	31	30
Birmingham . .	23	22	20	21	25	28	25	25
Leeds	35	34	34	34	35	35	37	34
London	35	34	34	35	39	44	43	37

It will be observed that for each month the London supply was superior to that of any of the other towns, except in January, February, and March, when it was almost equalled by Leeds. In the summer, it was very much higher because of the drought, which was not felt in the North. In Manchester, the rainfall for the period was 25 inches; and at the Thirlmere works 45 inches, against 10 inches in the Lea Valley. If the supply furnished by each London Company be taken separately, it appears that the lowest for any month was that of the East London during August. This was the period of the so-called "famine;" and the amount then supplied by the defaulting Company was equal to that of Manchester, and superior to that of Birmingham. In every other month, each of the Companies supplied more water per head than Liverpool, Manchester, and Birmingham.

Cost to the Consumers.—It is exceedingly difficult to compare the charges made by different water authorities, because they are levied on totally different systems. Most provincial towns make use of some highly-complicated scheme designed to suit the local requirements, and varying with them. They have a general rate, a domestic rate, and a number of special trade rates, which make comparison with the more simple method adopted in London merely misleading, unless it is very carefully and honestly carried out. This has been done, so far as it is possible, in the elaborate tables officially prepared for Parliament by Mr. A. J. Alexander, Mr. Askwith, and Dr. Pole, in which the London water-rates are compared with those of fifteen provincial towns. Leeds is not among them; but the other three are, and they will suffice. The tables show the comparative charges made on houses of thirty different values from £7 to £300 a year. It will be sufficient for the present purpose to take those rated at £10, £20, £30, £50, and £100 per annum.

Town.	£10.	£20.	£30.	£50.	£100.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Manchester . .	0 11 0	1 1 0	1 11 0	2 10 0	5 0 0
Liverpool . .	0 13 6	1 5 11	1 17 2	3 0 9	6 1 6
Birmingham . .	0 10 0	1 10 0	2 10 0	3 5 0	6 0 0
London	0 9 9	0 19 7	1 9 8	3 0 4	5 13 8

It appears from this table that consumers occupying houses of low and medium rateable value enjoy a considerable advantage in London; and this holds good generally with regard to other provincial towns besides the three given above. In other words, municipal authorities impose a relatively heavier burden on persons of small and moderate income than the London Water Companies—a somewhat singular result of popular government. As the rateable value increases, the comparative charges tend to rise, on the whole, in London, because those Companies who mainly serve the large areas of poverty in the east and south—viz., the East London, the Lambeth, and the Southwark and Vauxhall—impose a higher scale upon their wealthier consumers, who are comparatively few. The charges of the Companies which supply the superior Metropolitan districts are lower than the provincial average for almost all values, and in no case appreciably above it. Moreover, in towns like Manchester and Liverpool, a large revenue is obtained, by means of a general rate upon all property, from bodies and persons who in London do not pay a penny.

Purity.—There are no direct means of deciding the relative purity of water. Recent disclosures have shown that chemical, and still more bacteriological, examinations are valueless for comparative purposes, unless they are carried out in the same laboratory and on a systematic scale. An occasional analysis by this or that expert tells nothing. Water engineers are now accustomed to look more to results, as indicated by public health, when comparing one city with another in respect of purity; and the typhoid fever death-rate is commonly taken as an index. It is a rough but a real test, which no amount of laboratory evidence can override. If water does not make people ill, there is no harm in it, whatever the microscope or the test-tube may say. If it does, the examination which fails to detect the mischief—as in the case of the typhoid outbreak at Worthing or the cholera at Hamburg—is obviously faulty. Typhoid fever, it is true, does not depend solely upon the water supply. Places may have pure water, as in the case of Grimsby and Southend, and yet be troubled. But that consideration only cuts one way. Pure water does not necessarily exclude typhoid, but polluted water does not necessarily entail it; and it may be taken as certain that a place which enjoys comparative freedom from typhoid also enjoys a comparatively pure water. Judged by this test, London occupies a very favourable position. In the year 1895—the latest for which returns are available—the average typhoid death-rate of the 33 great towns was 20; that of London was 14, though it was in this year that the recently alleged pollution took place. The typhoid death-rate per 100,000 in the four leading cities comes out as follows: Manchester and Salford, 30; Liverpool, 37; Birmingham, 17; Leeds, 21; London, 14. If a term of years be taken, the advantage enjoyed by London is still more marked. Its consistently low typhoid rate is an absolute proof of the comparative excellence of the water. In this respect, it is not equalled by any town of first-rate importance in the United Kingdom having a public supply. It will be convenient to say a word here about Glasgow, which would have been included in the general comparison with London and the other great English towns but for lack of sufficient data. Owing to the fortunate proximity of Loch Katrine, Glasgow enjoys an exceptionally copious and cheap supply of water; but its average typhoid rate is pretty nearly double that of London. The same holds good in a still higher degree of those American cities which are held up to our admiration. Their supply is nominally colossal in quantity, but not good in quality. The average typhoid rate for the last six years in 28 principal American towns was 50 per 100,000.

Regularity.—One of the most popular grievances against the London Water Companies is the liability of their supply to interruption; and it has received a great impetus from the general breakdown which occurred through frost early in 1895, and from the partial failure of the East London supply in the summers of 1895 and 1896. In point of fact, the charge rests almost entirely upon these three incidents. The East London case may be dismissed. The responsibility for the breakdown has been repeatedly proved to rest, not with the Company, but with the public bodies who interfered with their plans. As for the great frost two years ago, consumers had just grounds for indignation. A vast number of pipes were frozen because they had been laid too shallow by the Companies. But exactly the same thing happened everywhere else to the pipes of public water authorities. Their mains were laid no deeper, and were no more respected by the frost, than those belonging to the Companies. In Glasgow, it is interesting to notice, the consumption of water increased, on account of burst pipes, from 46 to 55 million gallons a day; and it remained afterwards at 51 millions, in spite of all efforts to reduce it. From this it appears that the accusation of wasting water by neglect to repair mains, which was brought against the East London Company, and disproved by the fact of the consumption returning to the normal, might have been made with more show of reason against the Municipal Authority of Glasgow. Apart from the frost, the constant supply has been repeatedly interrupted both in Manchester and Liverpool. In Manchester, it was suspended on account of drought in 1884, 1887, 1888, and 1893—in the last-mentioned year, for no fewer than 67 days. During all these years, the Corporation had powers to draw additional water from Windermere. The Act of Parliament authorizing the works was obtained in May, 1879; but, in spite of repeated water famines, no additional supply was procured from this source for upwards of fifteen years, and then only one line of pipes was laid, whereas five lines were authorized. The line that has been completed carries 10 million gallons of water a day, which have been available since October, 1894, and have brought the average daily supply per head up to about 25 gallons. The maximum given by this Municipal Authority is 10 gallons per head less than the average of the London Companies; and it has taken fifteen years of recurring scarcity to obtain that, though the water is even now unfiltered. Similar histories might be related of many other towns. In Birmingham, for instance, the water undertaking has been in the hands of the Corporation for upwards of twenty years, yet the supply still remains smaller and more liable to interruption than even that of Manchester.

Statutory Conditions.—When ammunition is required for the campaign against the Water Companies, it can always be obtained in abundance by appealing to popular prejudice on the ground of the "oppressive powers" granted to them by the law and of their "arbitrary" treatment of consumers. This appeal never fails with any section of the community; and it is mainly responsible for the general odium in which the Companies are held. The simple truth is that they possess less oppressive powers than any municipal authority, and exercise those they have in a less peremptory manner. It is improbable that any public authority would undertake a water supply upon the conditions with which the London Companies have to be content, for, without more effective control than they possess, it is impossible to check waste efficiently. The comparatively meagre supplies which the great provincial towns have been shown to provide for their inhabitants could not be made to suffice in dry seasons, if consumers were not subject to more drastic regulations than in London. This is not a matter of argument but of statute, which anyone can test for himself by comparing the bye-laws of the Companies with those, for instance, of Manchester or Glasgow. To give them here is impossible; but attention may be drawn to two points in particular. The Manchester regulations contain the following: "All taps and other water-fittings must be tested and stamped by the proper officer of the Corporation." This provision is identical with the famous clause 17, on which it is now pretended the County Council based their opposition to the East London Company's Bill in 1893. As a fact, the clause was withdrawn before the second reading; and the spokesmen of the County Council explicitly stated that their opposition was not based upon it. But it suits their apologists now to put it forward as an excuse, and to declaim against its oppressive character. It was copied from the bye-laws of Manchester or Glasgow or some other town; for it is universally, or all but universally, enforced by municipal water authorities. They test and stamp, at the owner's expense, all fittings; and they order repairs and renewals up to the municipal standard, also at the owner's expense, at 24 hours' notice. But no London Company is allowed to do these things. A second regulation, widely but less universally enforced, is the employment of standard workmen as well as standard fittings. In Manchester, Oldham, Leicester, Nottingham, Huddersfield, and many other towns, free plumbing is forbidden—that is to say, the householder must employ only men approved by the Corporation. Various other advantages enjoyed by public water authorities might be mentioned; but perhaps the foregoing may suffice, as the London Companies possess no counter-advantages to set against them. The power to cut off water and exact penalties for offences is possessed by all public authorities, and exercised by them, as a rule, far more severely than by private companies, for obvious reasons.

To sum up, the present water supply of London will, on the whole, compare favourably with that provided by any public authority; and to the great majority of municipal supplies it is distinctly superior in every single respect. It is more copious, cheaper, purer, more regular, and less oppressively conditioned. It does not follow that it cannot be improved; but the facts lend no support to the contention that any improvement is likely to be effected by municipalization.

Local Authorities and the South Staffordshire Water-Works.—A scheme is on foot for the purchase of the South Staffordshire Water Company's undertaking by the various Local Authorities within the area of supply. A conference is being arranged to consider the subject.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh appointment is filled up. As I write it is practically the case; and before this appears is print, it will be formally so. At this moment I do not know who the favoured individual is, as the Commissioners have—I think without doing any good to anybody—resolved that the name shall not be divulged until Monday, when they are to meet to formally make the appointment. The Committee met last Monday, and reduced the short leet of five to three, by dropping the names of Mr. Ewing and Mr. Townsley; leaving in Mr. Bell, Mr. Herring, and Mr. Wilson. The appointment lies therefore among the three latter gentlemen. So far as is known at present, the most prominent members of the Commission favour Mr. Herring's appointment; and one newspaper has announced its understanding that he has got the post. As, however, the whole truth will be known before these "Notes" are read, there is no need to say anything more on this point.* Monday last was the ordinary committee-day of the Commission; and the whole of the members being upon one or other of the Committees, there was an informal gathering of the Commissioners, after their ordinary business had been transacted, to talk over the matter. It was at this meeting that the three names were fixed; and at the same time instructions were given that the names were not to be communicated to the public. How loyally this order was obeyed, was shown by the fact that within little more than an hour after the meeting terminated, the evening newspapers contained the names of those who were left in. The Commissioners met again yesterday, in private, and agreed upon the gentleman whose name is to be announced on Monday. There was, I understand, some difference of opinion as to who should get the post; but it is expected that on Monday the appointment will be quite unanimous. Meantime letters of "appointment and regret" have been posted; so, though the Commissioners are keeping the matter dark at home, it is well known outside of Edinburgh who has been selected.

Before leaving Edinburgh, I may say that on Tuesday the Town Council remitted to the Lord Provost's Committee to consider and report upon the subject of the analysis of the gas supplied to the city from the Portobello works, and of the submission of a report by the Analyst to the Magistrates and Council.

The Corporation of Dunfermline again sat in private on Monday, to consider the business of their gas undertaking. It is authoritatively announced, however, that the Council adopted the Local Authorities Loans (Scotland) Acts, 1891 and 1893, which means that the loan required in connection with the purchase of the gas-works, and all the loans which are not hampered by conditions which prevent them from coming within the scope of the Loans Acts, are to be converted into stock, and will carry a dividend of 3 per cent. per annum. In recent years, stock conversion schemes have been much favoured by corporations; and in not a few cases 3 per cents. are actually sought at a considerable premium. What the Council meantime propose to do, is to convert stock of the value of £132,000 (the total is not on any account to exceed £150,000), to be applied as follows: A.—£106,100 for (1) the sum of £100,000 for the gas-works; (2) £2500 in respect of a sum borrowed for causewaying and improving the streets; (3) £600 to meet the sum borrowed in connection with improvements at the slaughter-house; and (4) £3000 on account of the money borrowed in connection with the Infectious Diseases Hospital. B.—£16,650 in respect of sums borrowed under the Public Health Act. C.—£9250 for repaying the amount temporarily borrowed for the improvements made on the water-works some years ago. It is intended that the stock shall be redeemable at par on May 15, 1917, or any term of Whitsunday or Martinmas thereafter; the whole to be redeemable on or before May 15, 1947. The scheme was approved at the Council meeting on Monday; and at the same time it was unanimously agreed to allow the Town Clerk (Mr. Simpson) £300 for his work in connection with the gas-works reference.

The Stirling Police Commission had the subject of the proposed gas transfer before them on both Monday and yesterday. On Monday, supplementary reports by Mr. J. M'Gilchrist, of Dumbarton, whom the Commissioners consulted in the matter, were submitted. Mr. M'Gilchrist's concluding report was as follows: "I am asked to advise in the altered position of affairs; the Gas Company having refused the Police Commissioners' offer of £61,130. I think, on the whole—and more especially after hearing the correspondence between the Commissioners and the Gas Company—that the Gas Company are not altogether unreasonable in requesting an Oversman to determine the price as between the two valuations. Assuming the Oversman splits the difference between the two valuations of £61,130 and £68,320, making the price £64,725, I would strongly advise you to purchase at this price. It would be a good bargain, and one of the cheapest transfers that has taken place. The Stirling Gas Company supplied gas at the average price of companies with a make of 50 million cubic feet and upwards; and the average price of corporations was 3d. per 1000 cubic feet lower than the companies. The Stirling Gas Company, while charging a slightly lower price on the past five years on the average of these companies, have paid an average dividend on the £4 shares of 7s. 4d., or at the rate of 9⅛ per cent. The Dunfermline Gas Company, while charging 3d. per 1000 cubic feet more than Stirling, supplied gas of a lower illuminating power. The Dunfermline transfer being the latest, a comparison with Stirling might not be uninteresting. In Dunfermline, the annual manufacture was 65,187,000 cubic feet; and the price awarded per million cubic feet manufactured was £1410. In Stirling, the annual manufacture was 62,614,000 cubic feet; and taking the mean of the two valuations, the price would be £1034. The Dunfermline Corporation had to take over £11,900 of mortgages at a higher rate per cent. than Corporations could now borrow money at. The Dunfermline transfer was considered by the trade not high. The question is, Will it pay the Stirling Commissioners to take the works over at this price of £64,725? I think a better opportunity will not soon come again. The Company paid in dividends during the past five years an average of £2729. By charging a higher price per 1000 cubic feet, they could easily, like Dunfermline, have paid more. Assuming the whole undertaking, complete in every respect, costs you £64,000, to which we must add £6000 for extensions and improvements, making a total of (say) £70,000, this sum borrowed at 3 per cent. for interest and 1 per cent. for sinking fund means £2800, or £71 more per annum than the Company have been paying in dividends. Of this sum £700 is virtually profit, because it is invested in a sinking fund for the reduction of the price of the works. Now the improved results of the manufacture of gas would amount to at least 2s. 6d. per ton of coal carbonized. Say 7000 tons of coal are carbonized per annum, this saving will yield a sum of £875, or a profit, after paying the interest and sinking fund, of about £800 per annum; or if the sinking fund be not included the total profits would be over £1500 per annum. This profit will easily be obtained by the improved system of carbonizing coal, producing about 1000 cubic feet of gas more per ton of coal carbonized, and yielding a larger quantity of coke for sale. Other improvements would yield a profit on the scrubbing and purifying of the gas. At the present time, the scrubbing power in the gas-works was not capable of treating one-half of the quantity of gas manufactured; and a large percentage of the impurities were not extracted from the gas at the paying point. Let us assume Stirling, like all other burghs, will go on and prosper, the result must be that, as the quantity of gas used increases, the charge for interest will decrease. An increased make always favours a lower charge per 1000 cubic feet for labour, on-cost, &c. The expenditure of the £6000 referred to will enable you to manufacture 80 million cubic feet of gas per annum. Need I add this increased make would enable a reduction to be made in the selling price of the gas. The site of the gas-works is one of the best in the kingdom, and is capable of extension. The present site is equal to the manufacture of fully double the present requirements. Allow me to draw attention to the position you would occupy, in the event of deciding to terminate the negotiations at this time. Your Bill will be withdrawn; and the Gas Company will next year apply for an Act of Parliament. Should they get their Act, they would expend money on the works and make larger profits; and should the burgh at any future time wish to purchase the undertaking, they would require to pay five years' profits on the purchase price for the statutory Company, and an extra 10 per cent. for compulsory purchase. This altogether would reach a sum over six figures, or £100,000. In other words, you will then have to pay some three or four prices for the extensions and improvements already referred to. On the other hand, should the Commissioners oppose the Company, to be successful they will require to promote a new Bill empowering them to take over the undertaking; and this carries with it the 10 per cent. for compulsory purchase. The Company did not ask a sum for compulsory purchase." The subject was discussed last night by the Commissioners; and it was resolved, by 12 votes to 8, to submit the question of the price to be paid—limited to whether it should be the price suggested by Mr. M'Gilchrist, or that proposed by Mr. Gillespie—to Sheriff Lees. Why Sheriff Lees should be asked to decide the question, when the Commissioners have the reports of two experts on the subject, I cannot understand. Meantime, the Corporation Bill is before Parliament; and a petition against it has been signed on behalf of the Ward Committees.

The report by Mr. A. Wilson, the Manager to the Perth Gas Commission, states that the average illuminating power of the gas supplied during the past month was 27·01 candles. The gas made during the month showed an increase of 360,400 cubic feet, or an average of 2·15 per cent. over the same period of last year; the gas delivered in the month being an increase of 2·17 per cent. Over the year, there is an increase of 9·76 per cent. in the gas made; and 9·85 per cent. in the gas delivered. The Works Committee have had before them a recommendation by Mr. Wilson to adopt West's manual stoking machinery for the new gas-works to be erected at Friarton. The estimated cost of an installation of this system, capable of producing 1,500,000 cubic feet of gas per 24 hours, is £12,880. The Committee, before coming to a decision, agreed to have the report and notes containing further particulars circulated among the members.

Mr. J. M'Gilchrist, of Dumbarton, was present, as adviser, at a meeting of the Stirling Police Commission this week, in connection with the proposed gas transfer. In answer to a question by a Commissioner as to whether he had considered what effect the introduction of electric lighting would have on the gas consumption, he said that Ayr and Coatbridge were the only two burghs in Scotland where they found the electric light competing against a private Gas Company; and he had received information on the subject a few days before from the Gas Managers of these towns. In Ayr, the price of gas was 3s. 4d. per 1000 cubic feet; and since the electric light installation two years ago, the manufacture of gas had increased. The Ayr Manager added: "Our town councillors are afraid to refer to the electric light at any public meeting now, as they are hissed when they mention it." In Coatbridge, an Electric Light Company had laid down plant of the value of £26,000; but the undertaking had been a failure, and the loss was something like £1400 a year to the Company. On the other hand, the Gas Company increased the manufacture of gas by 5 million cubic feet last year; and the Electric Light Company were desirous of selling their undertaking to the Gas Company.

At Helensburgh, the Police Commissioners have appointed a Committee of three to inquire into the terms on which the Gas Company would be willing to sell their undertaking to the Corporation, and to inquire into the more economical lighting of the burgh.

A meeting of ratepayers in Saltcoats was held on Tuesday night, to consider the proposal by the Police Commissioners to acquire the Gas Company's undertaking. Several of the Police Commissioners were present. Mr. A. Hamilton said that the ratepayers were quite in the dark as to the negotiations regarding the purchase of the gas-works. The matter had never been explained to them; and they were not in a position to express an opinion about it. An objection to the purchase had been lodged, so that the Commissioners might tell the ratepayers what they proposed to do. Mr. Hunter stated that he had been against the purchase of the gas-works; but after considering the report of an expert on the cost of introducing electric light to the burgh, he believed that the latter scheme was impracticable owing to the cost. He now thought that to purchase the gas-works would be the best scheme. Mr. R. Fleck said the price asked for the gas-works—£10,200—was fair and reasonable; and it would prove a good investment for the ratepayers. Provost Smith thought that electric lighting was too costly for the burgh; and that the purchase of the gas-

* Later information (sent yesterday), appearing on p. 342, shows that Mr. Herring is the successful candidate.

works, with a probable increase of population, would be a remunerative scheme. He urged them, before deciding against purchase, to appoint a committee to consider the question. A ratepayers' committee was afterwards appointed to go into the matter.

An accident, about which there is some mystery, occurred in the gas-works at Milngavie yesterday afternoon. Three men from a large firm of meter-makers were connecting the station meter, when an explosion occurred. The men were severely burned. The cause of the explosion is not known, as no light was near.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, Feb. 13.

Sulphate of Ammonia.—Throughout the week, the market has been quiet; and there has been a further slight decline in values—the closing quotation being £7 15s. per ton, f.o.b. at all the ports. Makers generally seem to be fairly comfortable; and there has been no great pressure to sell. But buying has been mainly done by dealers; and they are in no great hurry to cover their requirements. Consumers have been buying moderately at the decline, but are acting very cautiously in operating. The moderate price of £7 12s. 6d. is now quoted from London as for May-August delivery. Speculators are taking their cue from this lead; but their offering is mainly for nearer delivery. Speculative quotations on the Continent for March are slightly under spot prices; and for April at only a small premium.

Nitrate of Soda is quiet; but fairly steady at 8s. 1½d. per cwt. for ordinary, and 8s. 3d. for fine quality.

LONDON, Feb. 13.

Tar Products.—The market shows no encouraging feature; and the business done during the week has been of a humdrum character. The position of pitch is attracting a good deal of attention, as, by the present methods of carbonization, the percentage of pitch in the tar increases continually; and it becomes an important factor in the ultimate value obtainable from the products of distillation. Considerable business in anthracene is reported; but prices are said to be low, while buyers have again reduced their notions of value.

The following prices may be taken to represent the average of the week's business; and, in all cases excepting tar, subject to 2½ per cent. discount, as well as including casks, where it is the custom of the trade to employ them: Tar, 15s. to 22s. Pitch, 23s. Benzols, 90's, 3s.; 50's, 2s. 9d. Solvent naphtha, 1s. 7d. Crude, 30 per cent. naphtha, 1s. 1½d. Creosote, 1¼d.; liquid, 1⅛d. Heavy oils, 35s. to 40s. Naphthalene, 65s.; drained salts, 30s. Carbolic acid, 60's, 2s. Anthracene, "A" 8½d.; "B," 7½d.

Sulphate of Ammonia seems to be entirely in the hands of dealers. Notwithstanding the large business being done, the tendency of the market is to lower prices; and this is bound to be so if makers indiscretely press their sales. To show the effect of this, in one instance during the past week, a maker having a comparatively small quantity of sulphate to sell, offered it to at least eight different merchants; thus multiplying the quantity on the market to that extent. To-day's average value is about £7 12s. 6d., less 2½ per cent. at all ports.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There has been rather a falling off in the weight of business coming forward in the coal trade here. Pits are still generally working full time; but colliery owners are scarcely moving away their present output, especially in the lower descriptions of fuel. The slackening off in the demand for domestic requirements is necessarily causing increased quantities of common round coals to be offered for steam and forge purposes; and these consequently show an easing down upon prices recently obtainable. At the pit mouth, best Wigan Arley averages 10s. 6d. to 11s. per ton; Pemberton four-feet and seconds Arley, 8s. 6d. to 9s.; and ordinary steam and forge coal, 6s. to 6s. 3d. Engine fuel is becoming more of a drug upon the market; and collieries that have hitherto been moving away their production without difficulty, are now finding some descriptions hanging on their hands. The result is that, in the open market, surplus lots are being offered at very low figures; while generally prices show a tendency to droop. At the pit, common slack does not average more than 2s. 9d. to 3s. per ton; medium sorts, 3s. 9d. to 4s. 3d.; and best qualities, 4s. 6d. up to 4s. 9d. The shipping trade continues fair; but with the increased supplies of common round coal on the market, sales for shipment have been pushed at lower figures.

Northern Coal Trade.—There has been an increased activity in the coal trade; and the shipments have developed largely. The more settled weather has allowed full work, both at collieries and ports. In best Northumbrian steam coals, work has not been quite so full; and the price is easy at 7s. 10½d. to 8s. per ton f.o.b. Second-class steam coals are quoted at 7s. 3d. to 7s. 6d. per ton; and steam smalls, at 3s. per ton. The first of the large contracts for coal for shipment over the season has been decided—that for the Swedish State Railways. It is for delivery at several ports, so that the rate depends on the freight that may be paid. For the Durham coal that will be taken, the price is about 5d. or 6d. per ton above that of a year ago. In the gas coal trade the demand is still very strong, chiefly on the old contracts; but there are one or two contracts that are now being tendered for, which will help to define the prices that are likely to rule for the shipping season. Quotations that are made seem to be on the basis of from 7s. 3d. to 7s. 6d. per ton f.o.b. for best Durham gas coals. There is no alteration in the price of gas coke; but the exports seem to be a little fuller to some of the near Continental ports.

Scotch Coal Trade.—The improved state of trade still continues, and prospects are looking better. Some of the foreign contracts which were lost two years ago are beginning to return; while there is hope that more may come in during the spring. The shipping trade is growing satisfactorily. The miners are now getting plenty of work, which has led, in the meantime, to the silencing of the demand for an increase of wages. The prices quoted are: Main, 6s. 9d. per ton f.o.b. Glasgow; ell, 7s. to 7s. 3d.; and splint, 7s. 6d. The shipments for the week amounted to 142,362 tons—an increase of 21,893 tons over the preceding week, and of 28,899 tons over the corresponding week of last year. For the year to date, the total shipments have amounted to 653,606 tons—an increase over the same period of last year of 120,159 tons.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 340).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	24—26	+1	4 0 9
100,000	10	,,	7½	Do. 7 p. c.	17½—18½	..	4 1 1
300,000	100	2 Jan.	5	Australian (Sydney) 5% Deb.	108—111	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	9⅞—10½	−¼	4 17 7
100,000	Stck.	30 Dec.	5	Do. 5 p. c. Deb. Stk	102—105	..	4 15 3
200,000	5	12 Nov.	6½	Bombay, Limited	6½—7½	..	4 6 8
40,000	5	,,	6½	Do. New, £4 paid	4½—5½	..	4 14 6
380,000	Stck.	13 Aug.	12	Brentford Consolidated	290—295	..	4 1 4
210,000	,,	,,	9	Do. New	227—232	..	3 17 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
159,375	,,	11 Dec.	4	Do. 4 p. c. Deb. Stock.	130—134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	270—275	..	4 3 7
208,820	,,	,,	8½	Do. A Ord. Stk.	198—203	+11	4 3 9
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	130—135	+4	3 14 1
420,000	20	15 Oct.	11½	British	56½—57½	..	3 18 3
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	24—26	..	4 8 6
71,000	10	,,	8½	Do. 7 p. c.	19—21	..	4 0 11
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	9½—10½	..	5 14 3
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	101—103	..	5 16 6
150,000	20	14 Jan.	8½	Cagliari, Limited	29—31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	15½—16½	..	3 12 9
50,000	50	3 Nov.	6	Do. 6 p. c. 1st Mort.	57—59	..	5 1 8
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	338—343	..	3 18 8
165,000	,,	,,	10½	Do. New do.	255—260	..	4 0 9
165,000	,,	11 Dec.	4½	Do. 4½ p. c. Deb. do.	150—155	..	2 18 0
800,000	Stck.	30 Dec.	13	Continental Union, Limited.	260—265	..	4 18 1
200,000	,,	,,	10	Do. 7 p. c. Pref.	215—220	..	4 10 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.	315—320	..	4 7 6
163,400	,,	,,	11	Do. B 7 p. c.	250—255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p.c. Stk	140—143	..	3 13 5
60,000	,,	,,	5	Do. 5 p. c. Pref.	140—145	..	3 9 0
486,090	10	14 Jan.	11	European, Limited	25½—26½	+½	4 3 0
354,760	10	,,	11	Do. £7 10s. paid	17½—18½	..	4 6 11
5,746,590	Stck.	13 Aug	12½	Gaslight & Coke, A, Ordinary	315—320*	+1	3 19 0
100,000	,,	,,	4	Do. B, 4 p. c. max.	108—113*	..	3 10 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	305—310*	..	3 4 0
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	145—150*	..	3 6 8
63,000	,,	,,	7½	Do. G, 7½ p. c. do.	210—215*	..	3 9 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	207—212*	..	3 6 0
463,000	,,	,,	10	Do J, 10 p. c. Prf.	305—310*	..	3 4 6
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	177—182*	..	3 5 11
1,061,150	,,	11 Dec	4	Do. 4 p. c. Deb. Stk.	137—142	..	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	150—155	..	2 18 1
908,000	,,	,,	6	Do 6 p. c. do.	207—212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China, Limited	12—13	..	4 12 4

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	12 Nov.	12	Imperial Continental	222—226	..	5 6 2
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	99—102	..	3 18 5
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	105—108	..	3 4 10
75,000	5	11 Dec.	6	Malta & Mediterranean, Ltd.	6—6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	111—115	..	4 6 11
250,000	100	,,	4½	Do. 4½ p. c. Debs.	109—111	..	4 1 1
541,920	20	12 Nov.	5	Monte Video, Limited	15¼—16½	..	6 1
150,000	5	26 Nov.	8	Oriental, Limited	8⅛—9	..	4 8 11
135,000	5	,,	8	Do. New, £4 10s. paid	7⅛—8	..	4 10 0
15,000	5	,,	8	Do. do. 1879, £1 paid	1⅝—2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5—5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	100—105	..	5 14 3
500,000	100	1 Dec.	6	of Chicago } 2nd Do.	100-105	..	5 14 3
250,000	10	30 Sept.	10	San Paulo, Limited	13—14	..	7 2 10
5,475,000	Stck.	13 Aug.	5 2/10	South Metrop., 4 p.c. Ord.	147—150	+2	3 9 0
820,000	,,	14 Jan.	5	Do. 5 p. c. Deb. Stk.	169—172	..	2 18 2
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	280—290	..	3 19 4
60,900	,,	,,	8½	Do. B	190—200	..	4 5 0
170,380	10	30 Dec.	10	Tuscan, Limited.	14—15	..	6 13 4
149,900	10	2 Jan.	5	Do. 5 p. c. Debs. Red.	101—103	..	4 17 1
				WATER COMPANIES.			
746,159	Stck.	30 Dec.	10½	Chelsea, Ordinary	333—338	..	3 2 2
150,000	,,	,,	5	Do. 5 p. c. Pref.	175—180	..	2 15 6
160,000	,,	,,	4½	Do. 4½ p. c. Pref. Stk., 1875	158—162	..	2 15 6
175,785	,,	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162—167	..	2 13 11
1,719,514	Stck.	15 Oct.	7	East London, Ordinary	232—237	..	2 19 1
554,740	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	162—167	..	2 13 11
225,000	,,	,,	3	Do. 3 p. c. Deb. Stk.	105—107	..	2 16 1
700,000	50	11 Dec.	7½	Grand Junction, 10 p.c. max.	117—122	..	3 1 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—155	..	2 11 7
708,000	Stck.	13 Aug.	12	Kent	340—346*	..	3 9 4
160,000	,,	,,	7	Do. New, 7 p. c. max.	212—217*	..	3 4 6
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	275—280	+3	3 8 4
406,200	100	,,	7½	Do. 7½ p. c. max.	222—227	..	3 6 1
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150—153	..	2 12 3
500,000	100	13 Aug.	12 2/10	New River, New Shares	418—425*	..	2 19 0
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk.	152—155	..	2 11 7
902,300	Stck.	30 Dec.	6	S'thwk & V'xhall, Ordinary	155—160	..	3 15 0
126,500	100	,,	6	Do. Do. 7½ p. c. Max.	150—155	+1	3 17 5
489,200	Stck.	,,	5	Do. Do. 5 p. c. Pref.	175—180	..	2 15 7
1,019,585	,,	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	148—151	..	2 13 0
1,155,066	Stck.	11 Dec.	10	West Middlesex	312—317	..	3 3 1
200,000	,,	,,	4½	Do. 4½ p. c. Deb. Stk.	163—168	..	2 13 7

*Ex div.

Sales of Shares.—The following shares have recently been sold by auction or tender: Four £25 shares in the Southampton Gas Company for £41 per share; two lots of £50 of "A" stock of the Mitcham and Wimbledon Gas Company for £120 each; and one lot of £30 of "A" stock for £72. The £5000 of 5 per cent. perpetual debenture stock offered by the Southampton Gas Company for public competition by tender realized £8050; this being at the rate of £161 per cent.

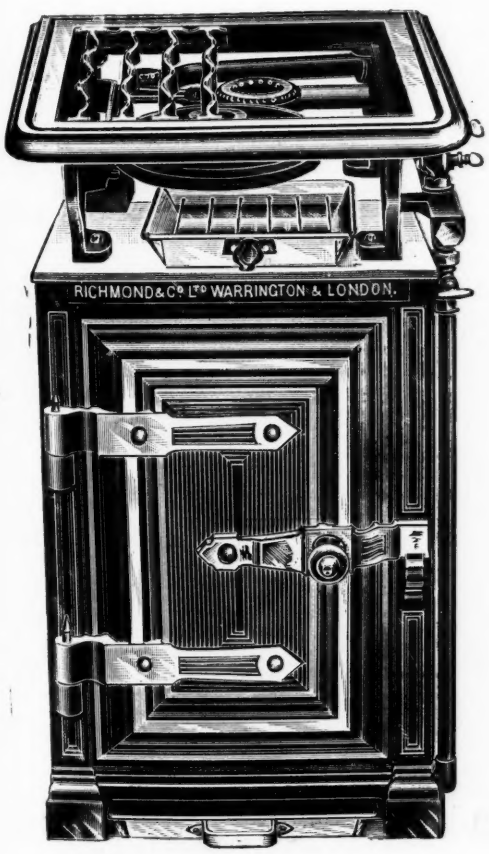
Barnet District Gas and Water Company.—The gas revenue of this Company in the six months ending Dec. 31, last amounted to £9914; the water revenue, to £9196—the expenditure being £6617 and £3265 respectively. The balance standing to the credit of the net revenue account is £15,395, out of which the Directors will recommend, at the meeting of the Company on the 26th inst., dividends at the rate of 9 per cent. per annum on the "A" and "C" stocks, 8 per cent. per annum on the "B" stock, and £6 6s. per cent. per annum on the "D" capital gas and water stocks.

Arbitration in Connection with the Welsh Water Scheme of the Birmingham Corporation.—At the Surveyors' Institute recently, Mr. C. Oakley, as Umpire, and Mr. S. Williams and Mr. R. Vigers, as Arbitrators, were engaged in hearing evidence with reference to a claim by the Rev. G. W. Prickard for £35,000 as value and compensation in respect to certain portions of freehold enclosed land and sheep-walk in the counties of Radnor and Montgomery, which have been compulsorily acquired for the purposes of the Welsh water scheme of the Birmingham Corporation. Counsel representing the claimant were Mr. Pember, Q.C., and Mr. Denman Binson; and those appearing for the Birmingham Corporation were Mr. Balfour Browne, Q.C., Mr. Cripps, Q.C., M.P., and Mr. H. G. Farrant. The values placed upon the property by the witnesses for the Corporation varied from £8405 to £10,255. The Arbitrator reserved his award.

The New Water-Works at Farnham.—The Farnham Water Company will be enabled at an early date to bring into use their new works at Gravel Hill. The additions consist of a covered service reservoir and two filter-beds. The water will be pumped from the Company's station, and will be first sent through a "splash," or trumpet-mouth, to promote aëration. It will then fall on to a layer of coke, and run along troughs filled with coke of large size and through pipes to catch-pits, and thence to the filter-beds, each of which has 2000 square feet of surface; the depth of material being 2 ft. 9 in. From the filter beds the water passes into a receiving chamber, situated in the centre of the beds, and then runs direct into the underground reservoir, delivered at high-water line. The reservoir has a capacity of 500,000 gallons; its dimensions being 95 ft. by 75 ft. 6 in. It has a concrete floor—walls and piers, supporting brick arches, forming the covering. The storage is equal to about four days' supply. There are ten ventilators; and the reservoir is made water-tight with asphalte and tar. The Company propose to deal with the whole of their supply at the new works, and hold the reservoir at Waverley in reserve. The scheme of the filter-beds and the system of filtration have been devised by the Company's Engineer and Manager (Mr. J. W. Lewis), with the special object of extracting from the water the iron with which it is highly charged.

Looe Water Supply.—Since the rejection by the Local Government Board of the schemes for the water supply of the villages of East and West Looe, to which reference was made in the "JOURNAL" of the 12th ult. (p. 90), the Parish Councils of the two places and the members of the Town Trusts have held a conference with a view to arriving at some agreement for deciding the question. The difficulty was expressed by one of the speakers, who said that an ample supply of water ought to be obtained without forcing the Trustees into bankruptcy. After considerable discussion, it was decided to ask the District Council to obtain consent to the Wringworthy scheme for supplementing the supply of East Looe, and for the use of the present means of distribution under a provisional arrangement with the Trustees of the Town Charity, pending a final arrangement of conditions with the Charity Commissioners. The West Looe Parish Council at the same time came to the conclusion that the supply of water under the control of the Charity Trustees of that village was the best available; and they expressed the opinion that the scheme of the Trustees would obviate all existing defects. They therefore urged the District Council not to press for any other scheme, but to leave the matter to the Trustees. The Liskeard Rural District Council have had these resolutions under consideration, and have decided to apply to the Local Government Board for sanction to borrow £3500 for the purpose of bringing the Wringworthy water to East Looe, and to send a deputation to the Board and the Charity Commissioners to arrange for the purchase of the East Looe Water-Works from the Town Trust. It has also been decided to lay the West Looe scheme before the Board.

Annual Winter Dinner of the Westminster Fitters of The Gaslight and Coke Company.—This dinner took place on the 5th inst., at the Horseshoe Hotel, under the presidency of Mr. G. Marvin, the Divisional Chief Inspector, who was supported by several staff officers. The Company numbered about 120, and included some visitors. In proposing the toast of the evening—"Prosperity to The Gaslight and Coke Company"—the Chairman reviewed the history of the Company, the first official meeting of which was held in July, 1807; a Charter of Incorporation being granted three years later. In 1814, the combined storage capacity of the three existing stations was only 52,000 cubic feet. He compared this with the enormous consumption of gas in the past year, which amounted to 20,116 million cubic feet sold. He coupled the toast with the name of his colleague, Mr. T. J. Bird; and expressed regret that their esteemed Chief, Mr. G. F. L. Foulger, was unavoidably absent. Mr. Bird, in reply, referred to the fact that he had served the Company for 36 years; and he gave various statistics showing the Company's increase of business. He said the number of stoves sold and on hire was no less than 85,000; while there was an addition of 45,000 automatic cookers in use. It was good for officers and men to "rub shoulders" sometimes, as each got a better idea of the other's work; and they met socially as well as officially. He, like the Chairman, regretted that Mr. Foulger was not present, as he had done great things for the department over which he presided. He had given dignity to it. It was he who looked after the interests of the officers and men under him; and in doing this he considered the Company's interests also. The usual toasts followed. An excellent programme of music was well rendered, and brought a very pleasant meeting to a conclusion.



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Gas Profits at Smethwick.—At a meeting of the Smethwick District Council last Tuesday, Mr. J. Stones, the Chairman of the Gas Committee, stated that the demand for gas during the previous week had been extraordinary, and the Committee had experienced great difficulty in satisfying their customers. The sales had exceeded those of the previous week by about 35 per cent. He mentioned that the Committee expected that the profit on the gas undertaking for the past year would be £3000. There had altogether been an increase of 10 per cent. in the consumption of gas for the year. A member suggested that, as the gas undertaking was likely to yield such a large profit, and the Committee had such bright prospects for the future, they might make a more liberal allowance towards the reduction of the rates—say, increase their contribution from £1200 to £2000.

The Charges for Professional Services in Connection with the Driffield Gas-Works Transfer.—The minutes of the Gas Committee which were adopted at last week's meeting of the Driffield District Council contained the following reference to this matter, which has (as already reported) been the subject of much debate in the Council: "The Committee having fully discussed with Mr. Tom Stephenson [the Solicitor] the costs and charges relating to the Provisional Order and the purchase from the Gas Company, as summarized in the minutes of this Committee of the 6th ult., Mr. Stephenson undertook to divide his bill for taxation into two items, one relating to the Provisional Order and the other to the purchase, and to reduce the total amount from £192 to £150, the bills to be taxed by consent, so as to give Mr. Stephenson the latter sum net. Mr. Stephenson was also to request Mr. Samuelson [one of the Engineers] in like manner to divide his bill, and also to make a considerable reduction in the amount. Messrs. Wellsted, Dougall, and Brodrick's fees to be also reduced."

The Sale of Sulphate of Ammonia by the Bury Corporation.—There was a short discussion at the monthly meeting of the Bury Town Council last Thursday as to the sale of the sulphate of ammonia made at the gas-works. The question was raised by Mr. Popple, who said that at the last Council meeting he was a party to refusing to sell this article at 12s. 6d. a ton more than the Committee charged for it, and for a very good reason. The next day the market price was another 12s. 6d. higher than that, or 25s. a ton more than the Heywood Corporation were charging for it. On the previous Friday, the market price was 20s. per ton above that at which the Committee proposed to sell it; and he suggested that in future this product should be sold by competition. Mr. Hodgkinson asked that a return be presented at the next meeting of the Committee showing the prices realized by the sale of sulphate. Mr. Maden, in reply, said the Committee did not stock sulphate; and he added that it was never sold without prices being obtained from the best buyers in the market. He knew that the Manager (Mr. W. H. S. Gendall) had often succeeded in getting from 2s. 6d. to 5s. per ton more than the prices quoted in the chemical papers; and it was always sold at the net price. The figure varied very much; and before disposing of what was in stock, the Committee carefully considered the prices. Answering a question put by a councillor, Mr. Maden said the quantity of sulphate made last year was 120 tons.

The Water Supply Difficulty at Saltash.—The difficulty which has arisen between the Saltash Corporation and the contractor for laying the main for supplying the town with water from Plymouth was under the consideration of the Town Council last Tuesday. The Solicitors for Mr. J. Shaddock, the Contractor, wrote that he would at once proceed with the work of relaying the main under the River Tamar, and bring the water into the town. In a further letter, a conference was suggested with a view to determining the responsibility for the joints which were found to be defective. The Water Committee recommended that the latter suggestion should not be entertained, but that, if the Engineer thought desirable, the time for the completion of the work should be extended to the 15th prox. This suggestion was adopted.

The Lichfield City Council and the Gas Company.—Replying to some questions addressed to him by Mr. Andrews at the meeting of the Lichfield City Council last Wednesday, the Town Clerk stated that the local Gas Company had a statutory right to pay a dividend of 10 per cent, and they had power, by their Special Act of 1878, to charge 4s. per 1000 cubic feet in the city, and 5s. outside. Mr. Andrews is a member of a Sub-Committee of the local Tradesmen's Association, who have had under consideration the questions of the price and quality of the gas supply; and, after the Town Clerk's reply, he moved that a Committee be appointed by the Council to investigate these matters, with power to engage the necessary assistance to examine the Company's Act and balance-sheets for the last ten years, and to approach the Directors with the object of securing a reduction in the price of gas and an improvement in its quality. The motion was carried; Committee appointed.

Douglas (Isle of Man) Water Supply.—A few months ago, Mr. G. H. Hill was instructed to report on the water supply of Douglas (Isle of Man), with a view to provide means for an extended supply, if, in his opinion, it should be found necessary. Mr. Hill's report has been received. He lays it down that, in view of the increasing population of the town, an increased water supply is absolutely necessary. He suggests two alternate schemes for the purpose of extending the supply—one being the construction of a reservoir at the lower end of the Ballacottier stream, Onchan. He estimates that the reservoir could be made at this place to hold 105 million gallons for £47,000 to £48,000. The other scheme is to construct a reservoir in the West Baldwin Valley. This site is admirably adapted for a reservoir, with a broad base; and he estimates that one could be formed here to hold 300 million gallons at a cost of about £49,500, or only £1500 more than that of the suggested reservoir at Ballacottier, while its capacity would be nearly three times greater. The engineering difficulties in connection with the West Baldwin scheme are much less than those of the Ballacottier scheme, inasmuch as the retaining embankment at West Baldwin would not be more than a quarter the length of that which would be required at Ballacottier. The great difficulty with regard to the former scheme arises from the enormous pressure which would result from the height of the reservoir above the town; and Mr. Hill suggests, as a means for getting over this difficulty, that a main should be laid over West Baldwin, and join the existing main at Parkfield, the height of which above the town is only from 200 to 300 feet.

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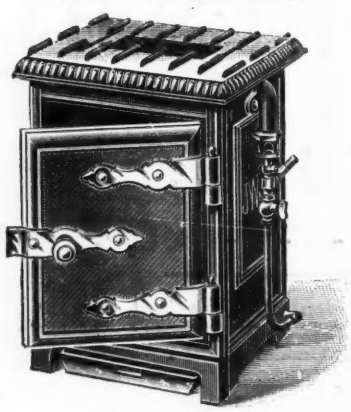

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Supposed Suffocation by Coal Gas at Leamington.—A Leamington Spa correspondent of the "Standard" reported yesterday the death, under somewhat mysterious circumstances, of Mr. Richard Green, an American gentleman, who was making a tour through this country. He was visiting his sister at Leamington, and on Saturday morning was found in his bedroom in an unconscious condition—expiring an hour later. The fatality is believed to have been caused by an escape of coal gas (not water gas, this time) into the room.

Knowle without Gas.—The inhabitants of Knowle can boast of having had a unique experience in the matter of gas supply. A short time since, the Gas Company sent out a circular-letter, expressing regret that, owing to a serious accident at the works, they would be "unable to supply any gas for the next few days." The tradesmen, hotel-keepers, and private residents had in consequence to resort to paraffin lamps or candles; while the services at the places of worship last Sunday week had also to be conducted by the aid of oil-lamps. The greatest dissatisfaction is expressed with the present order of things in connection with the gas supply; and a remedy is being sought by the consumers. At a public meeting held to consider the question last Tuesday, a deputation was appointed to wait on the Directors of the Company to ascertain what prospect there is of the district being more adequately lighted, and of a reduction being made in the present price of gas—viz., 5s. per 1000 cubic feet.

A London Factory for Messrs. Richmond and Co.—Having completed the extensions at their Warrington works, Messrs. Richmond and Co., Limited, still find themselves unable to compete with their increasing trade, especially in London and the South of England. This is notably the case with their automatic stove business among the London and Suburban Gas Companies; and in order to properly deal with it, they have taken large works in London. They run parallel with the Great Eastern Railway, at Stratford, and have an excellent road frontage. They cover considerably more than an acre of ground, and contain three fitting-shops, each 100 ft. by 60 ft.; grinding and casting stores, 109 ft. by 50 ft.; warehouse, and offices, &c.—the total floor space of the whole building being upwards of 32,000 square feet. The premises are well adapted for the business; being furnished with two Galloway boilers, a 40-horse power engine, shafting, tanks, &c. The Company enter into possession almost immediately; and they hope to commence delivering goods at an early date. The Warrington works will in future supply the Northern and Midland districts, Scotland, and Ireland.

The New Issue of Brighton Gas Stock.—The largest room at the Auction Mart, Tokenhouse Yard, was crowded last Wednesday, when Mr. Alfred Richards carried out the instructions he had received from the Directors of the Brighton and Hove Gas Company, and offered for sale £10,000 of "A" ordinary stock of the Company. The stock ranks for a standard dividend of 7 per cent. per annum, subject to the sliding-scale; and the last dividend paid thereon was at the rate of 8½ per cent. per annum. The new issue was put up in 100 lots, which were knocked down at the following prices: 1 at £204, 5 at £203 10s., 10 at £203, 32 at £202 10s., 27 at £202, 10 at £201, 5 at £200 10s., and 10 at £200. The average price realized was £202. The quotation of this stock in the "Journal" last Tuesday was 187-92, with a half-year's dividend shortly to be paid. But as the parcel of stock sold the next day will not bear dividend till after the 1st prox., the price it realized is equivalent to upwards of £206. As evidence of the eagerness displayed by investors to secure gas stock, it may be mentioned that the whole of that offered by Mr. Richards last Wednesday was disposed of in twenty minutes; and if there had been three or four times the quantity available, it would have found ready purchasers.

Purchase of Land, &c., for the Bradford New Water-Works.—The minutes which the Water Committee presented to the Bradford Town Council last Tuesday contained various resolutions in regard to the purchase of easements and compensation for spoil banks and tenant rights in connection with the new water-works, and a resolution accepting the offer of Mr. Richard Allen to sell to the Corporation for £8000 the unexpired term of 3000 years of and in the farm, dwelling-house, outbuildings, lands, and premises, situate at The Lodge, Middlesmoor, containing 880 acres and 39 perches, free from all incumbrances except lord's rent, land-tax, and tithes, on condition that Mr. Allen be allowed to rent the premises and the shooting thereof for a period of seven years, at the rental of £150 per annum. In moving the adoption of the minutes, Alderman Holdsworth took the opportunity of pointing out that since he became a member of the Water Committee the revenue from meter-rents and domestic supplies alone had increased from £80,000 a year to £132,000, and the other receipts brought up the total revenue to £150,000. These figures, he thought, showed that the undertaking was about as elastic a one as they could have in connection with a corporation. Last year £15,000 was needed for interest and sinking fund on new works, which were not yet productive. The minutes were adopted.

Reductions in Price.—The Directors of the Slaithwaite Gas Company announce a reduction in the price of gas from 3s. 9d. to 3s. 4d. per 1000 cubic feet; the concession dating from the 1st ult. The Calverley and Horsforth Gas Company have reduced their price from 2s. 11d. to 2s. 9d. per 1000 cubic feet as from April 1.

Smethwick Gas Supply.—Among the matters reported upon by the Gas Committee at the meeting of the Smethwick District Council last Tuesday, were two or three items of interest. A claim had been received from a coke contractor for damages to one of his boats, which was set on fire by hot coke at the gas-works; and the Committee had decided to settle it by the payment of £27, in addition to the value of the coke destroyed.

The Torrington Corporation and the Water Company.—A special meeting of the Torrington Water Company was held last Wednesday, to consider the scheme for the sale of the undertaking to the Corporation. It was decided to accept the offer of £6080 for the works; and, subject to the necessary ratification, and the application for a Provisional Order by the Corporation, the undertaking will be transferred to that body.

The Ossett Town Council and the Gas-Works.—At a meeting of the Ossett Town Council on Monday last week; it was reported that the General Purposes Committee had decided against taking a poll on the question of purchasing the gas-works. A motion was afterwards made that a poll of the owners and ratepayers should be taken. The voting, however, was even; and the Mayor (Alderman J. Cox) declined to give a casting vote, recommending that the matter should be again brought forward.

Completion of the Water-Gas Plant at Stockton.—The Gas Engineer of the Stockton Corporation Gas-Works (Mr. W. Ford) has reported to his Committee that Messrs. Humphreys and Glasgow have completed the installation of carburetted water-gas plant; and a trial will be made as soon as the requisite pipes have been laid. It seems that this adjunct to the works was not put in hand any too soon; for the make of gas during December last was 45,296,000 cubic feet, which was an increase of 2,656,000 cubic feet on the corresponding month of 1895, which necessitated the use of nearly the whole of the carbonizing plant. The water-gas installation is equal to a production of 500,000 cubic feet per day.

Cagliari Gas and Water Company, Limited.—At the forthcoming general meeting of this Company, the Directors will report that the receipts on revenue account for the past year amounted to £23,842; and the expenditure, to £11,679—leaving, after the usual deduction for the sinking fund, a net revenue of £12,163. The amount available for division, including the balance brought forward, is £17,725. Out of this an interim dividend at the rate of 6 per cent. per annum was paid for the half year ending June 30; and the Directors recommend a dividend at the rate of 8 per cent. per annum for the second half of the year, making 7 per cent. for the year, together with a bonus of 5s. per share. These payments will amount to £12,375, and leave a balance of £5350 to be carried forward. For the first time in the Company's existence, extending over nearly 30 years, the supply of water had to be limited from May to October, owing to deficient rainfall; but relief came in November, and since then there has been an abundant supply. The water and gas receipts both show a falling off; but the expenditure on gas decreased by £134. The gas unaccounted for has averaged 4½ per cent. of the make over the entire twelve months, as before. This is the first year that electric lighting has been undertaken by the Company; and it has resulted in a small profit.

The Richmond Corporation have just accepted a tender to the amount of £898 from Messrs. Simpson and Co, Limited, for a Worthington pump; and one from Messrs. Alfred Williams and Co., for pipes, to the amount of £1609 if delivered by rail, or £1587 if by barge, at the option of the Corporation. The plant is required for the water-works.

The tender of the New Conveyor Company, Limited, for the new retort-house for the complete installation of inclined retorts, together with all the automatic coal-handling machinery, has been accepted by the Batley Corporation. Owing to the pressure upon the Company caused by this and other commissions, they have been compelled to decline two contracts similar to the above.

The Yeovil Gas Company having recently decided upon carrying out some important alterations and additions at their works, invited several well-known firms to submit designs and estimates—premiums being offered. Those prepared by Messrs. E. Cockey and Sons, Limited, of Frome, were awarded the first position; and the firm have been instructed to carry out the work in accordance with their plans, under the supervision of the Company's Engineer (Mr. E. Howell). The total outlay will be about £3000.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

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O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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[For Illustrated Advertisement, see Feb. 2, p. 258.]

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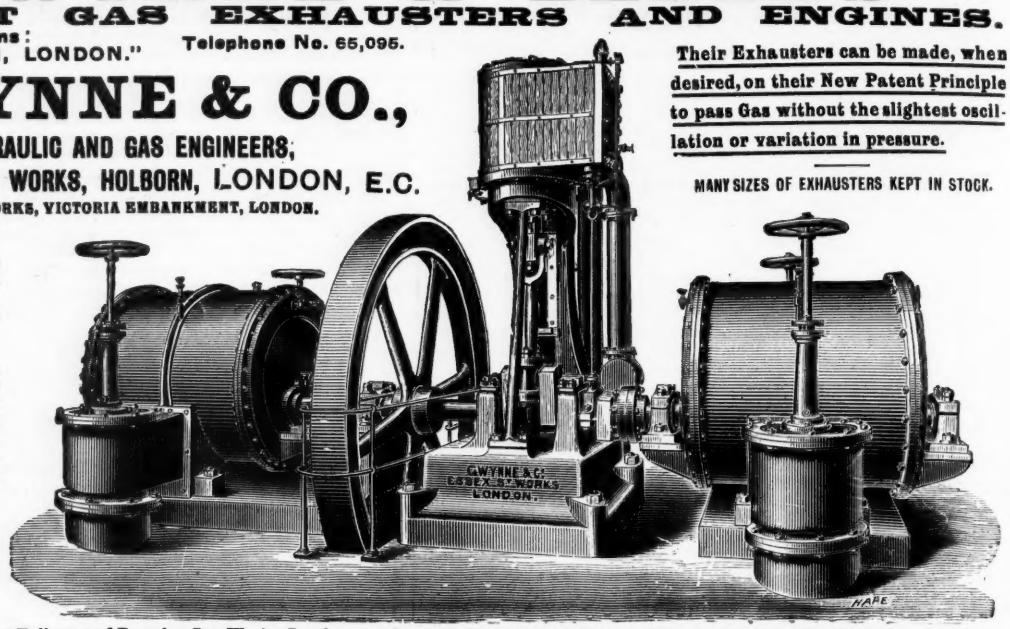

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Used to Engine and Exhauster. Age 29. Good References.
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WANTED, a Situation as Gas-Fitter and MAIN and SERVICE LAYER. Thirteen Years' Experience, with first-class Testimonials.
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WANTED, a Situation as Working MANAGER, accustomed to Main and Service Laying, Meter Fixing, Stoves and Cookers, and taking Indices. Good Carbonizer. Married, and an Abstainer. Good References.
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Correspondence invited.
Telegraphic Address: "Sadler, Middlesbrough."

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Apply, by letter, stating Experience and Wages required, to No. 2805, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a first-class Traveller, with good Connection, to represent leading House in GAS LIGHTING APPARATUS throughout the Midlands and South of England.
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Must have large experience in the Fitting Department. State Experience and Salary required. Situation would be a permanency.
Apply, by letter, to No. 2804, care of Mr. King, 11 Bolt Court, FLEET STREET, E.C.

RUTHIN WATER COMPANY.
WANTED, for a limited period, a Person to EXAMINE and REPAIR the MAINS and SERVICES in the Town; also conversant with the working of Deacon's Waste-Detecting Meter.
Applications, stating Wages required, with References and Testimonials as to ability, to be sent in to me on or before the 26th inst.
DAVID JONES,
Secretary.
Ruthin, Feb. 9, 1897.

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Apply, by letter, stating all Particulars as regards Experience and Salary required, &c., to No. 2803, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, a Competent and Experienced TRAVELLER to represent an old-established and well-known firm of Gas-Meter Manufacturers (Manchester and Leeds Districts will be excepted). Must have a good Connection among Gas-Works.

State Age, Qualifications, References, Terms, &c., to Box 61, P.O., OLDHAM.

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WANTED, a Gentleman, aged 25 to 35, energetic, and of good general business capacity, an Engineer by profession and experience, and conversant with water-works undertakings. To a suitable Candidate, this offers a favourable opening.

Apply, by letter, stating Salary required, and with not more than three recent testimonials, to No. 2794, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS TAR and Ammoniacal Liquor Wanted.

Apply to JOSIAH HARDMAN, Milton, STAFFS.

WANTED, to purchase Gas Carbon delivered at nearest Station to Gas-Works, in quantities of not less than 4 tons.

Address, stating Price per ton and quantity, No. 2772, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—A Bray's 300-Candle Power LANTERN and BURNERS complete. In good condition.

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GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also COMPLETE WORKS equal to 7000, 20,000, 60.000 cubic feet per diem. **Inquire and compare Prices and Particulars before ordering elsewhere.**

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THE whole of the costly Plant, now in excellent working order, including two large Gasholders and all the expensive Fittings throughout a well-known Mansion and Premises about 20 miles from London, TO BE SOLD at a sacrifice; the owner having no further use for the same. Any reasonable offer will be submitted.

Apply for further Information to HAMPTON AND SONS, 1, Cockspur Street, PALL MALL, S.W.

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One Two-Lift GASHOLDER and CAST-IRON TANK, 64 ft. by 16 ft.; Capacity, 98,000 cubic feet.

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Two PURIFIERS, 8 feet square, comp'ete, with 8-inch bye-pass Valves and Connections.

EXHAUSTERS, 5000 to 60,000 cubic feet per hour.

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Photos, Particulars, and Prices of above on application to SAML. WHILE AND SONS, 60, Queen Victoria Street, LONDON, E.C.

CORPORATION OF COLNE.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for IRONWORK required for Five SETTINGS complete, in Retort-House No. 2, comprising Stage Floor, Girders, &c.

Plans can be seen, and Specifications and Form of Tender obtained, at the Engineer's Office.

Tenders, endorsed "Ironwork," to be delivered to the undersigned on or before Saturday, the 20th day of February, 1897.

HY. SIMMONDS,
Engineer and General Manager.

Engineer's Office, Gas-Works,
Colne, Lancs., Feb. 2, 1897.

BARRY URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

THE Gas and Water Committee invite TENDERS for the surplus TAR and all the AMMONIACAL LIQUOR produced at their Gas-Works for One, Two, and Three Years from March 31 next. Coal carbonized this year about 6000 Tons.

The Tar and Liquor will be pumped into Contractor's Tank-Trucks at the Gas-Works Siding.

Sealed tenders, endorsed "Tender for Tar" or "Liquor," as the case may be, or both, stating Price per ton of 20 cwt. to be addressed to the Chairman of the Gas and Water Committee, on or before March 12 next.

Payments monthly.

Those tendering for the Liquor to state Price per ounce from 10 to 18 oz. strength, both inclusive.

Any further Information may be obtained on application to the Engineer and Manager, Mr. F. M. Harris.

The Committee do not bind themselves to accept the highest or any tender.

Gas-Works, Barry, Glam.,
Feb. 10, 1897.

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Address SECRETARY, Gas and Coke Company, Ltd., CRANLEIGH.

TENDERS are invited for Lighting the City of S. PAULO (BRAZIL) BY GAS, and must be sent under sealed covers, marked "Illuminaçao a Gaz da Cidade de S. Paulo," to the Secretaria da Agricultura, Commercio, e Obras Publicas (Department of Agriculture, Commerce, and Public Works), in time to reach the said Department not later than Three o'clock p.m., on April 30, 1897.

Particulars may be had on application, by letter, to the BRAZILIAN LEGATION, LONDON; or to the BRAZILIAN CONSULATES IN LONDON, LIVERPOOL, OR GLASGOW.

THE Urban District Council of Atherton invite TENDERS for the supply, during the Twelve Months ending March 31, 1898, of 5000 Tons of GAS COAL.

Forms of Tender and other Information may be obtained on application to the undersigned, to whom the tenders, endorsed "Gas Coal," should be delivered not later than Wednesday, March 3.

D. SCHOFIELD,
Clerk.

Atherton, Feb. 13, 1897.

TENDERS FOR GAS-MAINS.

THE Dover Gaslight Company invite TENDERS for 500 yards of 12-inch CAST-IRON GAS-MAINS, with Connections, and 750 yards of similar SMALLER MAINS.

Particulars, with Forms of Tender, can be obtained on application to me the undersigned.

The Company do not bind themselves to accept the lowest or any tender.

Tenders, marked "Tender for Mains," to be delivered on or before Saturday, the 20th inst., to me.

G. FIELDING,
Secretary.

Dover Gaslight Company,
14, Snargate Street, Dover.

LEIGH URBAN DISTRICT COUNCIL.

THE Gas Committee of the Leigh Urban District Council invite TENDERS for the supply of 120 Tons of OXIDE OF IRON PURIFYING MATERIAL, and for the purchase of 240 Tons of SPENT PURIFYING MATERIAL. Also for the supply of 130 Tons of SULPHURIC ACID for the Manufacture of Sulphate of Ammonia.

All Particulars may be obtained from the undersigned.

Sealed tenders, endorsed "New Oxide," "Spent Oxide," or "Sulphuric Acid," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, Leigh, on or before Monday, the 22nd inst.

ALFRED T. FLETCHER,
Engineer and Manager.

Gas-Works, Leigh, Lancs.,
Feb. 10, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

RETORT-HOUSE AND COAL-STORES.

TO BUILDERS AND CONTRACTORS.

THE Directors of this Company invite TENDERS for the erection of RETORT-HOUSE, COAL-STORES, &c., including Foundations and Drainage Work in connection therewith, at their Grimesthorpe Station.

The Main Buildings are 351 feet long by 146 feet wide and 44 feet high to Eaves; and the Foundations and Drainage will comprise some 7500 Cubic Yards of Excavation, 3400 Cubic Yards of Cement Concrete, 1100 feet run of 18-inch Brick Barrel Drain, &c.

Drawings and Specification may be seen, and Bill of Quantities, with Form of Tender obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Retort-House," must be delivered by post to the undersigned, at the Company's Offices, not later than the first post on Saturday, the 27th inst.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Feb. 2, 1897.

SHEFFIELD UNITED GASLIGHT COMPANY.

LIQUOR TANK AND GENERAL BUILDERS CASTINGS.

TO ENGINEERS, IRONFOUNDERS, &c.

THE Directors of this Company invite TENDERS for the supply and erection of a CAST-IRON LIQUOR TANK, 25 feet square, and the supply and delivery of GENERAL BUILDERS' CASTINGS for their Retort-House at Grimesthorpe Station.

Drawings may be seen, and Specification, with Bill of Quantities, obtained, on application to the Engineer, Mr. Fletcher W. Stevenson, on payment of 10s. 6d., which will be returned on receipt of a *bonâ-fide* tender.

Sealed tenders, endorsed "Tender for Tank and Castings," must be delivered to the undersigned by post, at the Company's Offices, not later than the first post on Saturday, the 27th inst.

The Directors do not bind themselves to accept the lowest or any tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
Feb. 6, 1897.

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the Sowerby Bridge Urban District Council are prepared to receive TENDERS for the supply of FIRE-CLAY RETORTS, FIRE-BRICKS, CLAY, &c., required for the Gas-Works at Sowerby Bridge and Luddenden Foot for the ensuing Twelve Months, and the fixing of the above Retorts. Also all the SULPHURIC ACID required at Sowerby Bridge during the next Twelve Months.

Specifications and Forms of Tender can be obtained by applying to Mr. John Marsland, Engineer and Manager, Gas-Works, Sowerby Bridge.

The Committee do not bind themselves to accept the lowest or any tender.

Tenders must be sent in not later than Tuesday, Feb. 23, 1897, endorsed "Tender for Retorts" or "Sulphuric Acid" or "Fixing Retorts," respectively, and addressed to

GODFREY RHODES AND EVANS,
Solicitors and Clerks to the Council.
Commercial Bank Chambers,
Halifax, Feb. 11, 1897.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the Bell Hotel, Bromley, Kent, on Thursday, the 25th day of February inst., at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare Dividends, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 11th to the 25th of February, 1897, both days inclusive.

By order of the Board,
HENRY W. AMOS,
Secretary.

Offices at the Works, Bromley,
Kent, Feb. 5, 1897.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the Lowestoft Water, Gas, and Market Company, the Administrator of H. F. Palmer, Esq., deceased, and other Owners.

GAS AND WATER STOCKS AND SHARES IN THE

Lowestoft Water, Gas, and Market Company.
Tottenham and Edmonton Gas and Coke Company.
West Ham Gas Company.
Barnet District Gas and Water Company.
South-West Suburban Water Company.
Ilford Gas Company, Tunbridge Wells Gas Company, Crays Gas Company, and West Kent Gas Company.

MR. ALFRED RICHARDS will Sell the above BY AUCTION, at the Mart, E.C., on Tuesday, March 2, at Two o'clock.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.
(INCORPORATED BY ACT OF PARLIAMENT, 1859.)

SALE OF £15,000 STOCK.

MR. ALFRED RICHARDS is instructed to SELL BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Tuesday, the 9th of March, 1897, at Two o'clock, in Lots of £100 and £50 each,

£15,000 OF "C" STOCK,

ranking for a Standard Dividend of 7 per cent., subject to the Sliding-Scale (the last Dividend on similar Stock having been at the rate of 8½ per cent.), and issued pursuant to the Company's Act of 1882.

Particulars may be obtained at the COMPANY'S OFFICES, Willoughby Lane, TOTTENHAM; of Messrs. MERRIMAN, PIKE, and MERRIMAN, Solicitors, 25, Austin Friars, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C., and 816, High Road, TOTTENHAM.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, Willoughby Lane, Tottenham, on Saturday, the 27th day of February inst., at Half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors, the Statement of Accounts for the Half Year ended the 31st day of December, 1896, to declare a Dividend, and transact such other Business as the Act of Parliament directs.

The TRANSFER BOOKS WILL BE CLOSED from Saturday, the 12th inst., until Monday, the 1st day of March next.

By order of the Board of Directors,
JAMES RANDALL,
Secretary.

Offices of the Company:
Willoughby Lane, Tottenham,
Feb. 5, 1897.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF DEBENTURE STOCK.

THE Directors have instructed Mr. ROBERT MACK, Auctioneer, to SELL BY AUCTION, at the Offices of the Company, Grainger Street West, Newcastle-upon-Tyne, on Wednesday, the 24th day of February, 1897, at Half-past Twelve o'clock precisely, £45,000 of the NEWCASTLE-UPON-TYNE AND GATESHEAD GAS DEBENTURE STOCK, bearing Interest at 3½ per cent. per annum, payable Half Yearly on the 1st of January and the 1st of July, being part of the moneys authorized to be raised by the Newcastle-upon-Tyne and Gateshead Gas Act, 1896.

For Conditions of Sale and further Particulars, apply to the undersigned.

THOS. WADDOM,
Secretary.

Gas Office, Newcastle-upon-Tyne,
Jan. 26, 1897.

CHELSEA WATER-WORKS COMPANY.

2¾ PER CENT. DEBENTURE STOCK.
MINIMUM PRICE: £98 PER CENT.

ISSUE OF AN AMOUNT TO REALIZE £50,000.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above ISSUE, being the whole of the amount created and authorized under the Chelsea Water-Works Act, 1896, bearing Interest at 2¾ per cent. per annum, and Redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.

Minimum Price: £98 per cent.

Tenders must be delivered at the Company's Office, No. 41, Commercial Road, Pimlico, S.W., not later than Eleven a.m., on Thursday, the 25th of February next.

Particulars and Conditions of Sale, together with Forms of Tender, may be obtained at the said Office, or will be forwarded on application.

By order of the Court of Directors,
G. H. GILL,
Secretary.

41, Commercial Road, Pimlico,
Jan. 14, 1897.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
8 Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

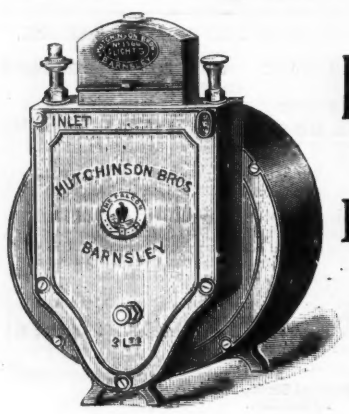
Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash . . . . . 1·34 Per Cent.
Tar . . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

HUTCHINSON BROTHERS,
GAS ENGINEERS, &c.,
MANUFACTURERS OF
Improved Wet & Dry Gas-Meters.
STATION-METERS. LAMP-METERS.
Test Gasholders and General Gas Apparatus.
Brass Main & Lamp Taps. Unions, Ferrules, &c.
The "Falcon" Lamplighter's Torch. Service Cleansers.
SYPHON AND OTHER PUMPS.
WOOD AND WROUGHT-IRON PURIFIER-GRIDS. SCRUBBER BOARDS.
WET AND DRY METERS REPAIRED.
FALCON WORKS, BARNSLEY.
Telegrams: "HUTCHINSON BROS., BARNSLEY."



TROTTER, HAINES, & CORBETT,

Brettell's Estate

FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD ST., E.C.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,

LIMITED,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

Lanemark Coal Co.,

LIMITED.

LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on Application to

LANEMARK COLLIERY,

NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

THE STAFFORDSHIRE TUBE CO.

TELEGRAMS:

"EVESON, BIRMINGHAM."

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.

For Illustration and Statement of Advantages to be gained by its use, see "JOURNAL," Feb. 2, p. 214.

ALFRED ARCULUS & CO., Glass Manufacturers,

BIRMINGHAM.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars, Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

FITTER.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 „
Ash	2·73 „

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

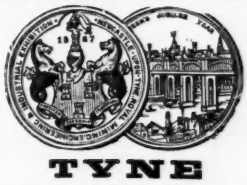
SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.



TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS,

COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED.

THE SUNLIGHT COMPANY having finally beaten the Welsbach Company in the Law Courts, notwithstanding the misleading statements which are being advertised, the Legal Position of its Mantle is now

ESTABLISHED BEYOND ALL QUESTION.

Mr. JUSTICE WILLS says in his Judgment: "No use is made by the Defendants (the Sunlight Company) of any of the rare earths; and their choice of substances, and their method of applying the illuminants, appear to me to be as wide asunder as the poles from those contemplated by Welsbach."

Therefore any interference with our Customers by the Incandescent Company in the use of our Mantles, either on our Burners *or on theirs*, should be promptly reported. **It will at once be summarily dealt with by us, without cost to our Customers.**

THE SUNLIGHT MANTLE gives a

SOFT MELLOW LIGHT, VERY

AGREEABLE TO THE EYESIGHT, AND HEIGHTENS THE

DECORATIVE EFFECT OF PLEASANT COLOURS.

WE ARE PREPARED TO *MAINTAIN ALL BURNERS* FITTED BY OURSELVES AT A VERY LOW PRICE PER ANNUM;

AND *SPECIAL TERMS* FOR *RENEWAL MANTLES* WILL ALSO BE MADE TO THOSE WHO PREFER TO DO SO THEMSELVES.

THE NEW INCANDESCENT (SUNLIGHT PATENT) GAS LIGHTING COMPANY, LIMITED,

33 & 34, SHOE LANE, LONDON, E.C.

PREPAYMENT METERS.

SIMPLE IN ACTION. POSITIVE IN RESULTS.

ROCK METER WORKS,

TELEPHONE Nº 2145
Telegraphic Address
AUTOMATIC MANCHESTER

THE Automatic Gas Meter 1895 Corporation Limited,
Tortworth Street Strangeways
MANCHESTER.
AND AT
49 Queen Victoria Street
LONDON.

ORDERS PUNCTUALLY ATTENDED TO.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1860.

STOURBRIDGE
RETORTS AND FIRE-BRICKS.
BEST QUALITY.
KING BROTHERS, STOURBRIDGE.
[See Illustrated Advertisement, Feb. 2, p. 259.]

ARROL-FOULIS
Patent Automatic Machinery
FOR
DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,
SIR WILLIAM ARROL & CO., Limited,
GLASGOW.
[See Illustrated Advertisement, Feb. 2, p. 262.]

LONDON OFFICE
60 QUEEN VICTORIA ST. E.C.

TELEGRAPHIC ADDRESSES
"DRAKESON HALIFAX."
"ECLAIRAGE LONDON."

TELEPHONE Nº 43.
"HALIFAX EXCHANGE"

GAS ENGINEERS.
CONTRACTORS.
IRONFOUNDERS.

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

JONAS DRAKE & SON
SOLE AGENTS FOR
HISLOP'S
PATENT REGENERATIVE FURNACES
— FOR —
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.
OVENDEN HALIFAX

Designs and Estimates on Application.

GASEOUS FIRING A SPECIALTY.

COLUMNLESS HOLDERS.

Notwithstanding the antagonistic influence of firms who are not permitted to construct Holders on **GADD & MASON'S PATENT SPIRAL GUIDE SYSTEM**, their adoption grows larger every year. Intelligent Gas Engineers appreciate the **GREATER SAFETY** of these Holders, and the very great **SAVING IN COST** of from **20** to **30 PER CENT.** No first-class Engineer should now think of paying for so much Metal in the shape of Columns, and the Labour of Erection.

A few months ago the "JOURNAL OF GAS LIGHTING" referred to

"THE KNELL OF GASHOLDER GUIDE-FRAMING,"

which speaks volumes.

In order to meet the ever-increasing demand, we have granted **Licenses for the construction of our patent System of Holders, to a select few of the leading Gasholder Makers,** from whom Estimates and Particulars can be obtained.

Gas Engineers are enjoined to avoid Firms who talk twaddle about Columns giving greater strength, merely in order to obtain an Extra Price for the weight of Metal therein and the Labour in Erection. Prices of Materials and Labour are constantly advancing—a sufficient reason why all Engineers should place their orders with Firms who can give them our Holders, and so save considerably in first cost, as well as Repairs, besides getting a **STRONGER, SAFER,** and a **BETTER SYSTEM.**

The first Gadd and Mason Holder was erected some Eight Years ago at Northwich. It has withstood the most violent Storms (one of which brought down the chimney stack), and we believe up to now has not cost a single fraction for Repairs.

American Licensees:
THE GAS ENGINEERING CO., PITTSBURG.

German Licensee:
HERR AUG. KLÖNNE, DORTMUND.

THE PATENT GASHOLDER SYNDICATE, 504, Stockport Rd., MANCHESTER.

W. J. JENKINS & CO.

GAS ENGINEERS AND IRONFOUNDERS,

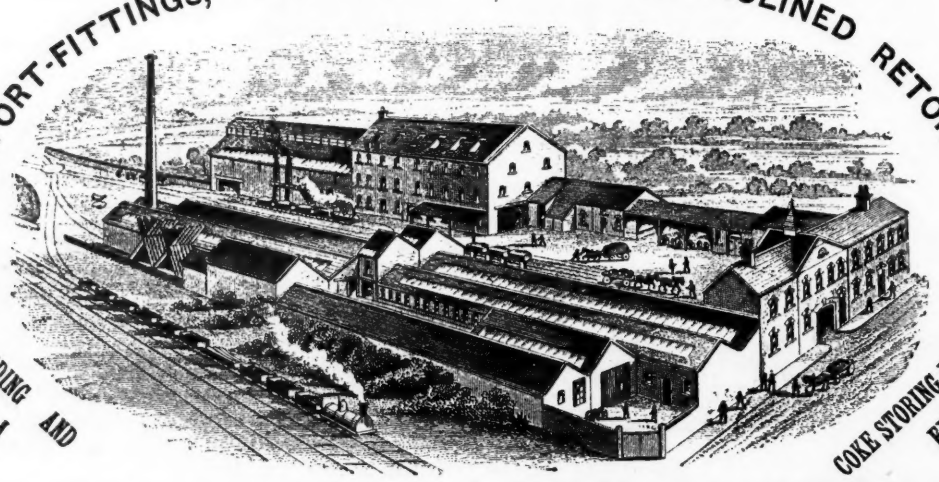
MAKERS OF ALL KINDS OF

PLANT AND MACHINERY FOR GAS-WORKS.

COAL-BREAKERS. COKE-SCREENS.

MOUTHPIECES. LIQUOR-TANKS.

RETORT-FITTINGS, REGENERATOR SETTINGS, INCLINED RETORTS.



COAL UNLOADING AND CONVEYING A SPECIALITY.

COKE STORING PLANT, ENGINES, EXHAUSTERS, VALVES.

BEEHIVE WORKS, RETFORD, NOTTS.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Preston	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Southport	750,000 ,,
Belfast (Second Contract)	4,500,000 ,,	Bath	1,000,000 ,,
Glasgow	300,000 ,,	New York	1,200,000 ,,
Brussels	700,000 ,,	Newburgh, N.Y.	350,000 ,,
Brussels (Second Contract)	700,000 ,,	St. Joseph, Mo.	750,000 ,,
Liverpool	3,500,000 ,,	Winchester	200,000 ,,
Tottenham	750,000 ,,	Hoylake	125,000 ,,
Tottenham (Second Contract)	750,000 ,,	Shanghai	225,000 ,,
Santiago	400,000 ,,	Holyoke, Mass.	600,000 ,,
Swansea	750,000 ,,	Stockport	500,000 ,,
Brighton	1,500,000 ,,		

And have now under Contract:—

Manchester	3,000,000 Cub. Ft.	Brentford	1,100,000 Cub. Ft.
Edinburgh	2,000,000 ,,	Commercial Gas Co., London	850,000 ,,
Stockton-on-Tees	500,000 ,,	Coventry	600,000 ,,
Norwich	1,000,000 ,,	Lea Bridge	350,000 ,,
Guildford	350,000 ,,	Newburgh, N.Y. (Second Contract)	250,000 ,,
Syracuse, N.Y.	850,000 ,,	Bordentown, N.J.	125,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. Telegrams: "EPISTOLARY, LONDON." *United States Office, 64, Broadway, New York.*

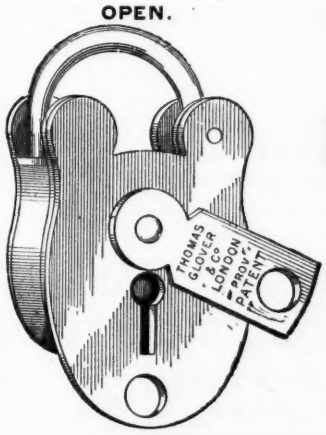
[ESTABLISHED 1844.] ORIGINAL MAKERS. [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

SECURE PADLOCK

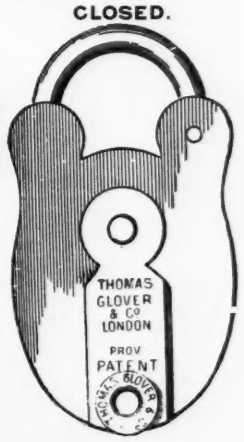
Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark.
Eyelets easily fixed and removed by Company's Collector.

Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

CLOSED.



THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL:	BIRMINGHAM:	MANCHESTER:
62, VICTORIA STREET.	1, OOZELLS STREET.	37, BLACKFRIARS STREET.
Telegraphic Address: "GOTHIC."	*Telegraphic Address: "GOTHIC."*	*Telegraphic Address: "GOTHIC."*

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

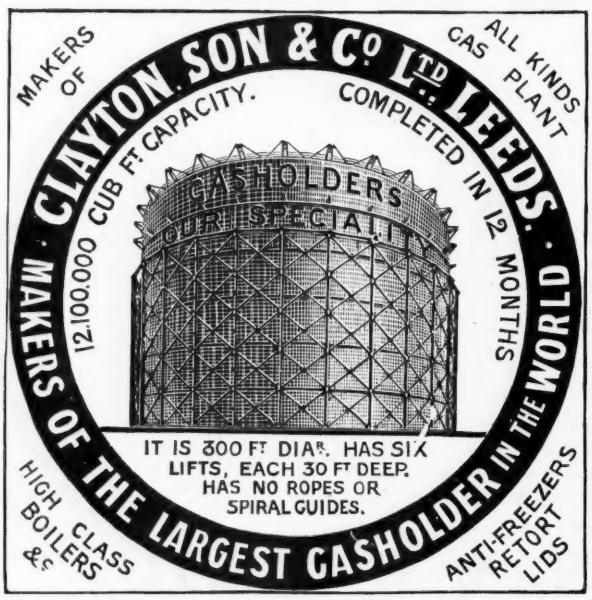
MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.
ESTABLISHED 1836.

OSLER,
BIRMINGHAM.
MANUFACTURERS
OF GASELIERS
IN GLASS AND METAL.

The Climax of Regenerative Gas Lighting!!

THE
"VERTMARCHE"
A 280-CANDLE POWER
PLAIN IRON LAMP,
CLASS A— **55/-**
LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.
Manufactured in England.

HENRY GREENE & SONS,
153 & 155, CANNON STREET,
LONDON BRIDGE, E.C.
PARTICULARS AND PRICES FREE. AGENTS WANTED.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
COMPLETED IN 12 MONTHS
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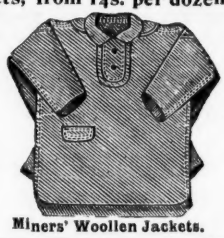
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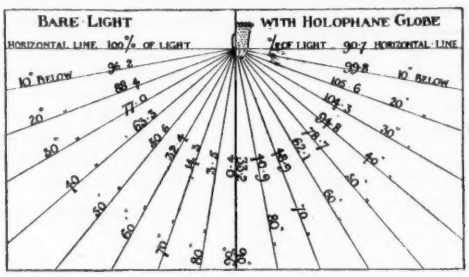

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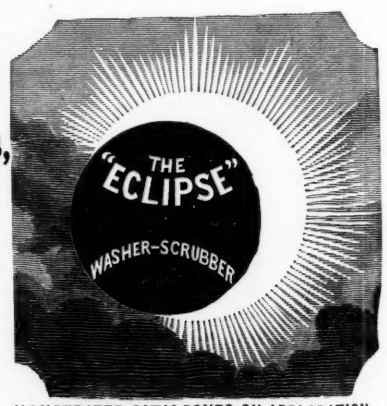

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